ISIS

INDIVIDUALIZED SCIENCE INSTRUCTIONAL SYSTEM

LET'S EAT

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INDIVIDUALIZED SCIENCE INSTRUCTIONAL SYSTEM

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Foreword

Evidence has been mounting that something is missing from secondary science teaching. More and more, students are rejecting science courses and turning to subjects that they consider to be more practical or significant. Numerous high school science teachers have concluded that what they are now teaching is appropriate for only a limited number of their students.

As their concern has mounted, many science teachers have tried to find instructional materials that encompass more appropriate content and that allow them to work individually with students who have different needs and talents. For the most part, this search has been frustrating because presently such materials are difficult, if not impossible, to find.

The Individualized Science Instructional System (ISIS) project was organized to produce an alternative for those teachers who are dissatisfied with current secondary science textbooks. Consequently, the content of the ISIS materials is unconventional as is the individualized teaching method that is built into them. In contrast with many current science texts which aim to "cover science," ISIS has tried to be selective and to limit our coverage to the topics that we judge will be most useful to today's students.

Obviously the needs and problems of individual schools and students vary widely. To accommodate the differences, ISIS decided against producing tightly structured, pre-sequenced textbooks. Instead, we are generating short, self-contained modules that cover a wide range of topics. The modules can be clustered into many types of courses, and we hope that teachers and administrators will utilize this flexibility to tailor-make curricula that are responsive to local needs and conditions.

ISIS is a cooperative effort involving many individuals and agencies. More than 75 scientists and educators have helped to generate the materials, and hundreds of teachers and thousands of students have been involved in the project's nationwide testing program. All of the ISIS endeavors have been supported by generous grants from the National Science Foundation. We hope that ISIS users will conclude that these large investments of time, money, and effort have been worthwhile.

Ernest Burkman

Ernest Burkman
ISIS Project   Tallahassee, Florida

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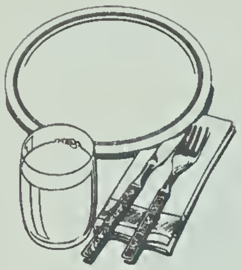
What's It All About?

People eat almost everything that grows. Their diets, whether made up mostly of meat and potatoes, fish and rice, or tortillas and beans, are all capable of meeting the basic need for food.

Why do people eat the foods they do? For that matter, why do people eat at all? Does it matter what foods they eat? What substances do foods contain?

In this minicourse, you'll learn about food requirements for good health. You'll compare what you eat with what food experts say you need. You'll also look at what is happening to the production of food in the world today and the problems some people face—hunger and malnutrition.



Activity 1
Core Planning

Activity 3 is required. Do it before you do Activities 4 and 5. The other activities may be done in any order.

Activity 2   Page 6

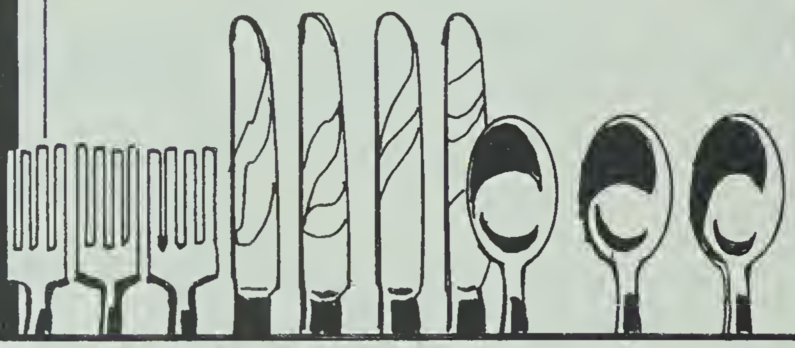
Objective 2-1: Tell why you need foods that contain carbohydrates, fats, and proteins.
Sample Question: Match each type of food with one of its functions.

Food
a. carbohydrate
b. fat
c. protein

Function
1. used for growth of muscle
2. highly concentrated source of energy
3. energy source most easily used by body

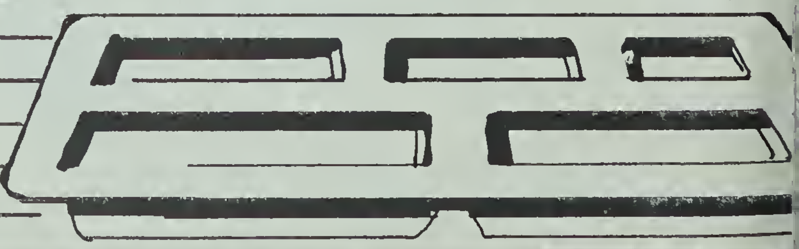
Activity 3   Page 12

REQUIRED ACTIVITY
In this activity you'll keep track of what you eat for a day.



Activity 4   Page 15

Objective 4-1: List the nutrients that make up a balanced diet, and determine whether or not you eat a balanced diet.
Sample Question: In addition to carbohydrates, fats, and proteins, what other nutrients should a balanced diet include?



MENU

Activity 5 Page 19

Objective 5-1: Tell what a food calorie is and how many you need every day to stay at your present weight.

Sample Question: What is a food calorie?

a. a measure of energy
b. 1000 calories
c. a kilocalorie

Objective 5-2: Determine the total number of food calories in the food you eat in a day.

Sample Question: Susan is on a liquid diet. One day she had 8 ounces of orange juice, three 8-oz glasses of milk, two 12-oz bottles of cola, and one 10-oz chocolate shake. According to the chart, how many food calories did she get?

SUSAN'S DIET

FOOD	AMOUNT	FOOD CALORIES
Cola	12 oz (369 g)	145
Lemonade	8 oz (248 g)	110
Milk, plain	8 oz (244 g)	160
Orange juice	8 oz (249 g)	120
Root beer	8 oz (370 g)	150
Shake, chocolate	10 oz (305 g)	310

Objective 5-3: Identify high and low calorie foods.

Sample Question: Which three of the following foods are low in calories: corn, celery, sundae, bread, chicken, almonds, shrimp, steak, macaroni, potato chips?

Activity 6 Page 25

Objective 6-1: Describe three health hazards of being overweight and two hazards of crash diets.

Sample Question: Being overweight is strongly linked to

a. high blood pressure.
b. diabetes.
c. diseases of the heart.
d. arthritis.
e. muscular dystrophy.
f. shorter life expectancy.
g. emphysema.

Activity 7 Page 29

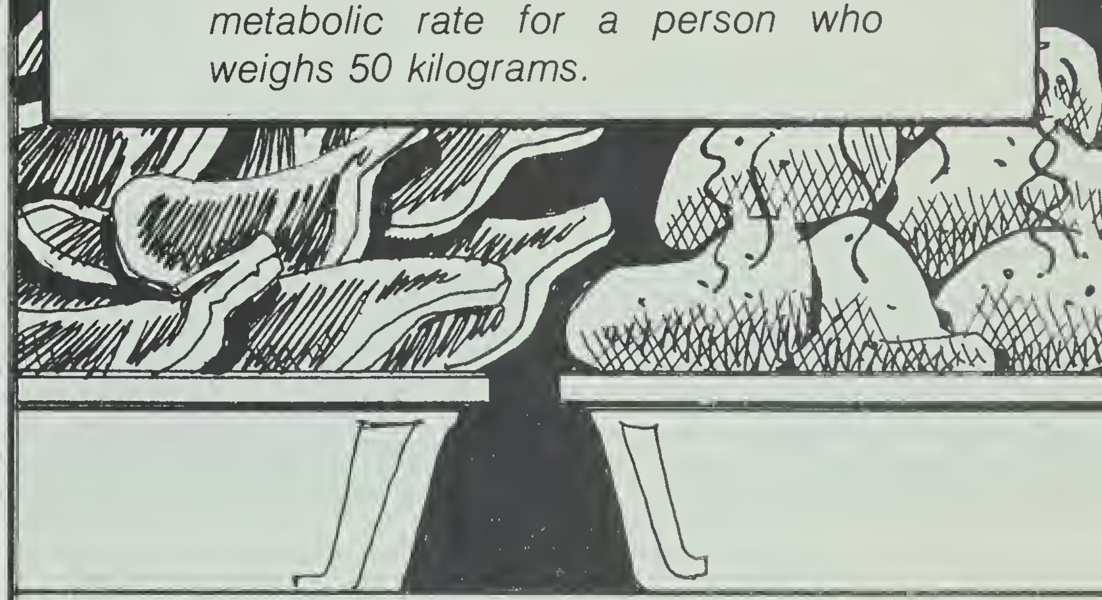
Objective 7-1: Explain why a good program for weight control should include plans for diet and exercise.

Sample Question: Why is it important to include a diet plan in a good weight control program?

a. to control intake of food energy
b. to maintain nutritional balance
c. to eat less to lose weight

Objective 7-2: Estimate a person's basal metabolic rate.

Sample Question: Estimate the basal metabolic rate for a person who weighs 50 kilograms.



Answers

2-1. a-3, b-2, c-1 **4-1.** vitamins and minerals **5-1.** a, b, c **5-2.** 1200 food calories **5-3.** celery, chicken, shrimp **6-1.** a, b, c, f **7-1.** a, b **7-2.** 1200 food calories per day

Activity 8 Page 36

Objective 8-1: Identify good food sources for vitamins and minerals and identify symptoms of vitamin and mineral deficiency.

Sample Question: Match each nutrient with a symptom of its deficiency.

Nutrient
- *a. iron*
- *b. vitamin C*
- *c. calcium*
- *d. vitamin A*

Deficiency
1. *anemia, "rundown" feeling*
2. *poor bone and teeth formation*
3. *poor night vision*
4. *easily bruised skin*
5. *poor blood clotting*

Objective 8-2: Describe the advantages and disadvantages of taking vitamin and mineral supplements.

Sample Question: Taking a large number of vitamin pills could cause an overdose of which vitamins?
- *a. A*
- *b.* B_2
- *c. C*
- *d. D*

Activity 9 Page 42

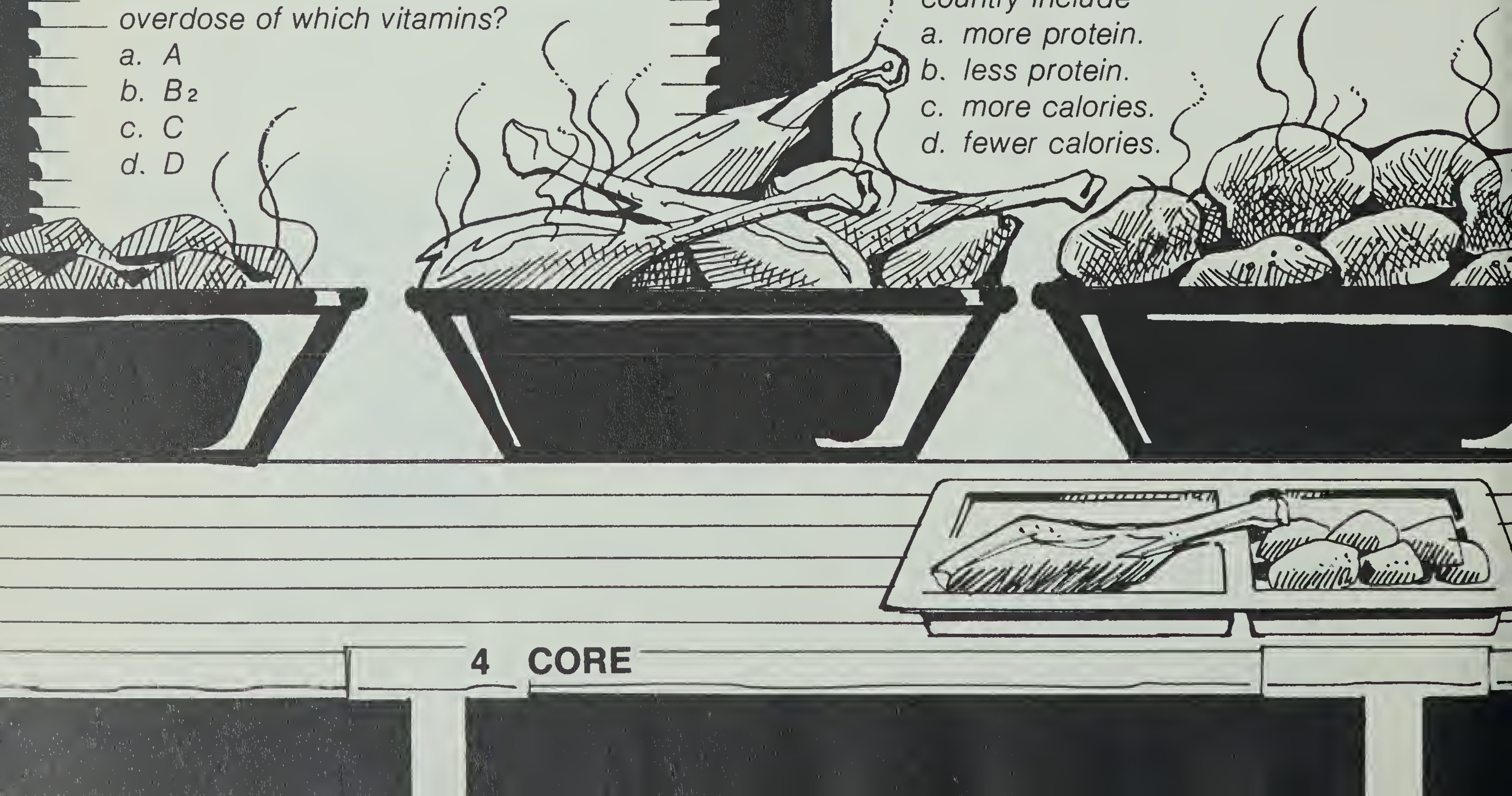
Objective 9-1: Tell how foods are related to tooth decay and describe two ways for reducing tooth decay.

Sample Question: If you eat a lot of candy and drink a lot of soft drinks, you may have many cavities in your teeth because
- *a. sugar dissolves the enamel on teeth.*
- *b. bacteria in the mouth act on the sugars to form acids.*
- *c. candy and soft drinks do not contain calcium.*

Activity 10 Page 46

Objective 10-1: Compare the amount of food per person and the quality of the diets in developed countries with those in developing countries.

Sample Question: Compared to the diets of people in a developing country, the diets of people in a developed country include
- *a. more protein.*
- *b. less protein.*
- *c. more calories.*
- *d. fewer calories.*

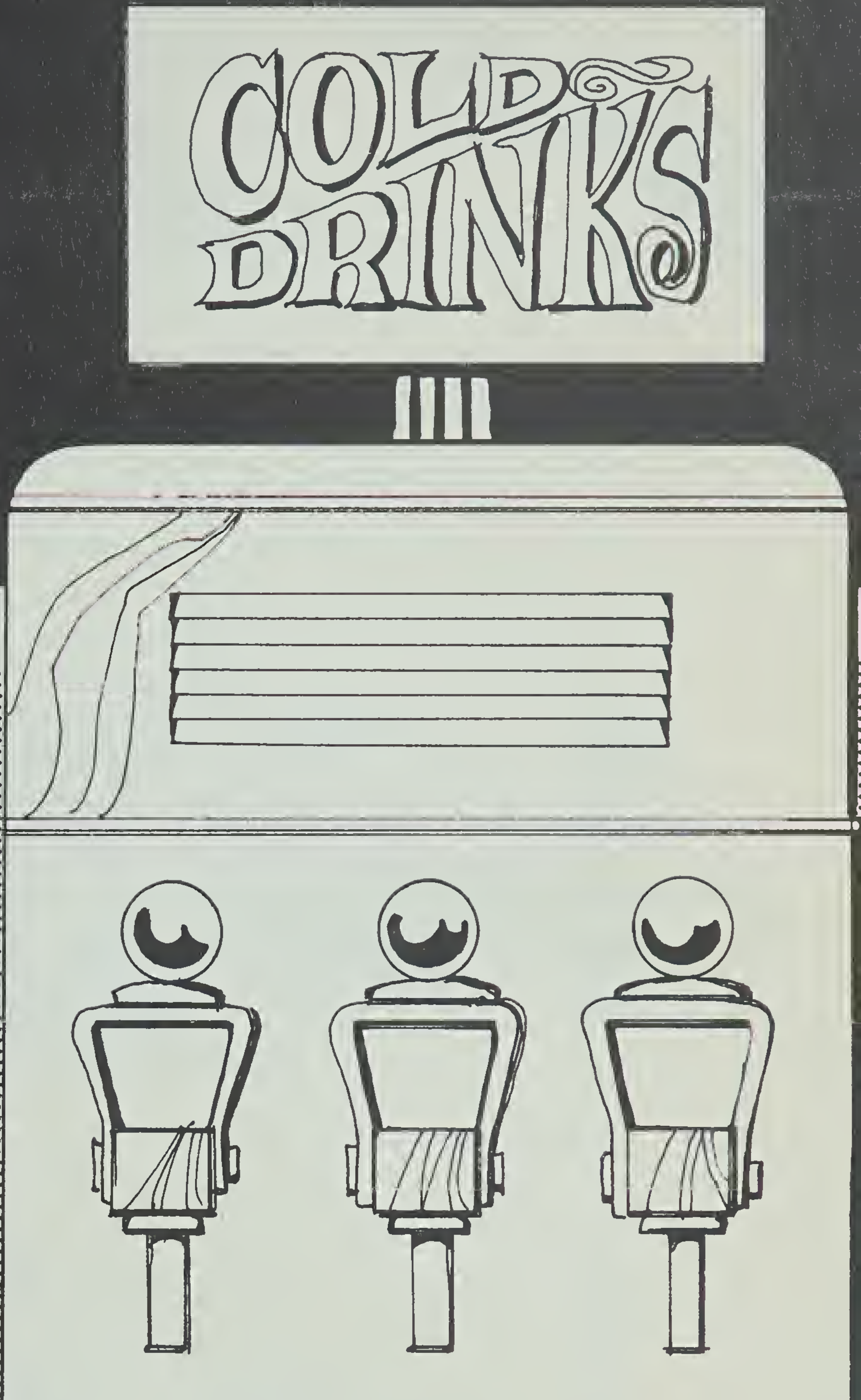


Activity 11 Page 52

Objective 11-1: Describe the role of technology in improving the kind and quality of food in the United States and identify some problems associated with the use of pesticides and fertilizers.

Sample Question: Which problems are associated with using fertilizer to grow crops?

a. Excess fertilizer pollutes rivers and lakes.
b. Excess food is produced and is left to decay, causing disease.
c. Some substances in fertilizers are possibly harmful to people.



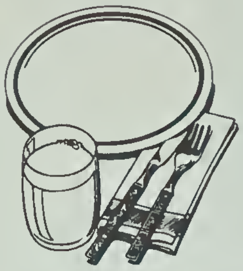
Activity 12 Page 56

Objective 12-1: Describe the external influences often related to overeating and tell how they can be controlled.

Sample Question: Which of the following is **least** *likely to stimulate overweight people to eat?*

a. time of day when snack or meal usually occurs
b. food smells in the kitchen
c. pleasant conversation about a hobby
d. seeing place where eating occurs

Answers
8-1. a-1, b-4, c-2, d-3 **8-2.** a, d
9-1. b **10-1.** a, c **11-1.** a, c **12-1.** c



Activity 2

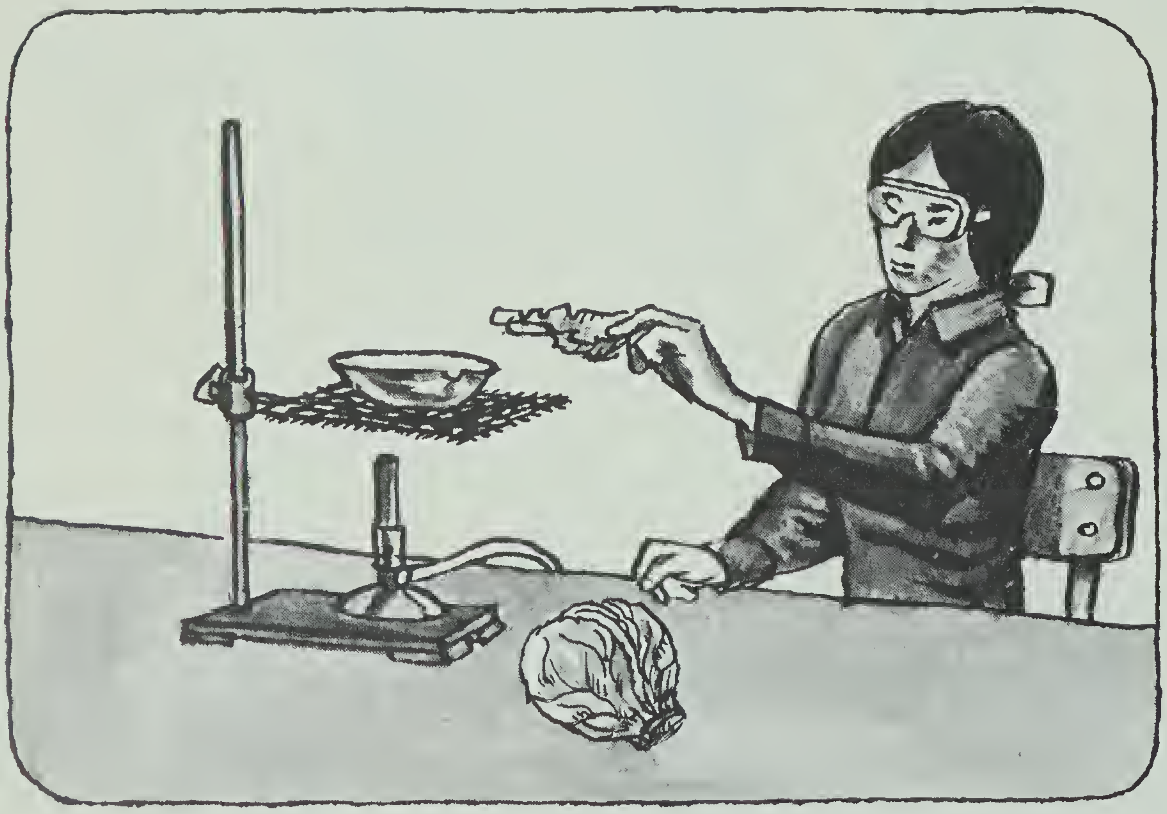
Food— More than Just for Eating

Almost all the food you eat comes from living things—both plants and animals. Food gives you what you need to move, grow, keep warm, and repair your body.

What is in food? To find out, you will need the following materials:

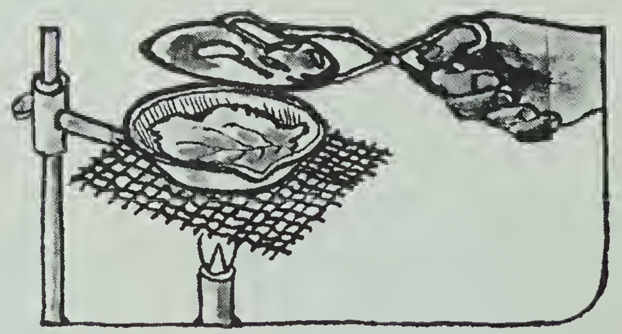
leaf from a plant, such as celery, lettuce, spinach, or collards
evaporating dish
safety goggles
Bunsen burner or other heat source
support stand
ring support with clamp
wire gauze
tongs, all-purpose
watch glass

If you don't know how to use a burner, do *Resource Unit 17* before you begin this investigation.



A. Put the leaf in the evaporating dish. Heat the leaf until it gets warm.

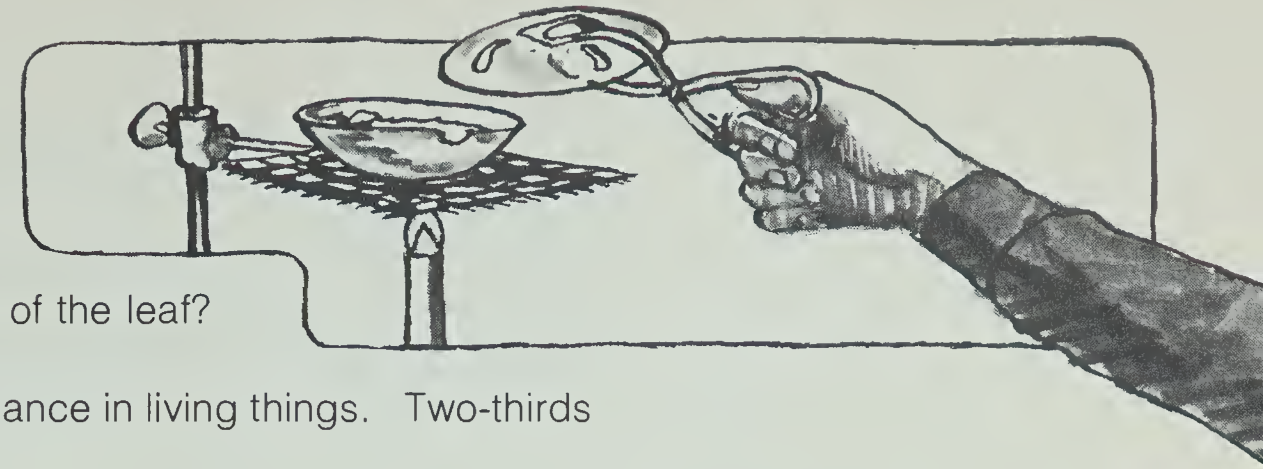
B. Use tongs to place the watch glass over the evaporating dish. Avoid putting the watch glass in the flame.



- 2–1. What substance forms on the watch glass?

- 2–2. Where did this substance come from?

C. Remove the watch glass and continue heating the leaf for 5 to 10 minutes.

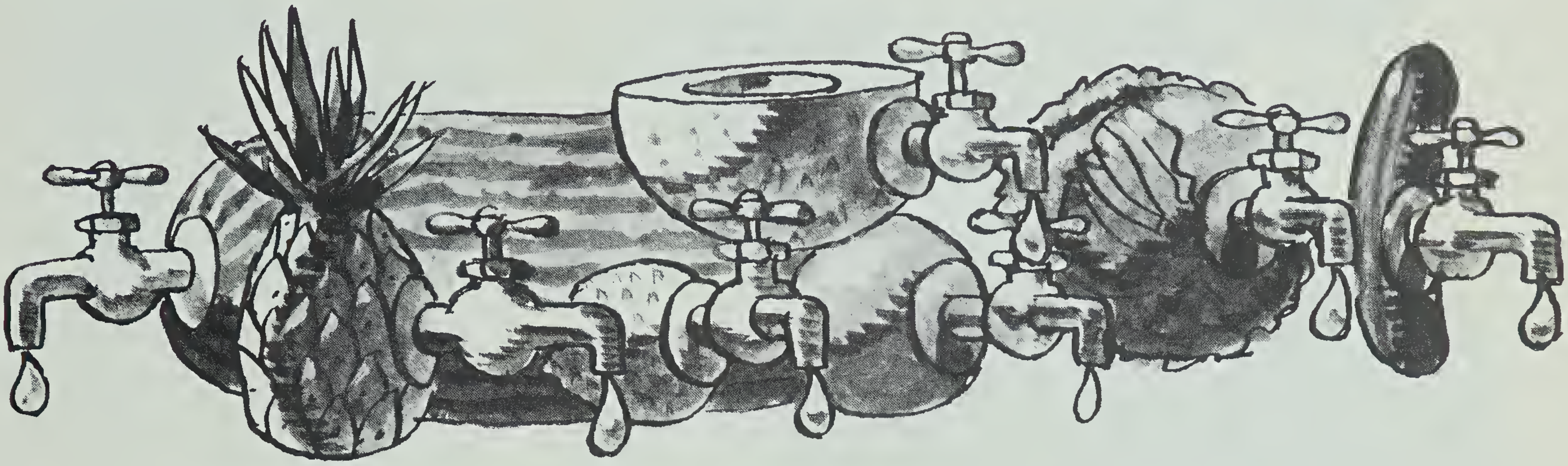


- 2–3. What happens to the color of the leaf?

Water is the most abundant substance in living things. Two-thirds of your body weight is water.

- 2–4. Calculate the weight of the water in your body.

Nearly all foods contain water. A cucumber, for example, is about ninety-five percent water. Even meat can be as much as eighty percent water.



- 2–5. Name three foods you eat that are high in water content.

The black substance left in the dish after burning the leaf is mostly the element carbon. Almost everything you eat contains carbon. There are millions of different carbon compounds in food. But they all fit into three main groups: carbohydrates, fats, and proteins.

Look at these three groups of foods one at a time.

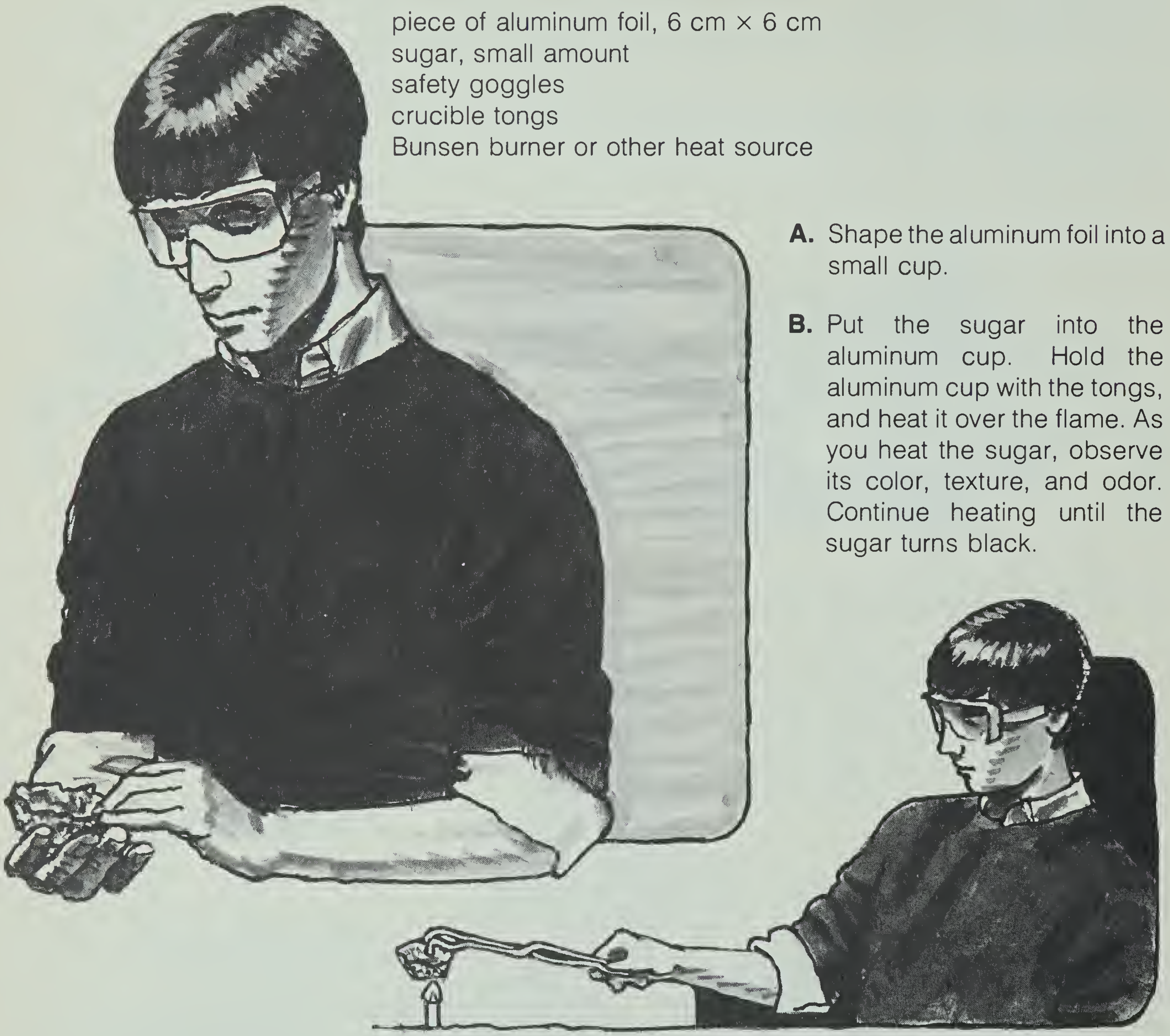
CARBOHYDRATES

Carbohydrates include all sugars and starches. One kind of sugar, called *sucrose,* is the sugar you put into tea or coffee or sprinkle over breakfast cereal.

All sugars and starches contain the elements carbon, hydrogen, and oxygen. Carbohydrates are different from each other only in the amounts of carbon, hydrogen, and oxygen they contain.

To investigate sugar, get the following materials:

piece of aluminum foil, 6 cm × 6 cm
sugar, small amount
safety goggles
crucible tongs
Bunsen burner or other heat source



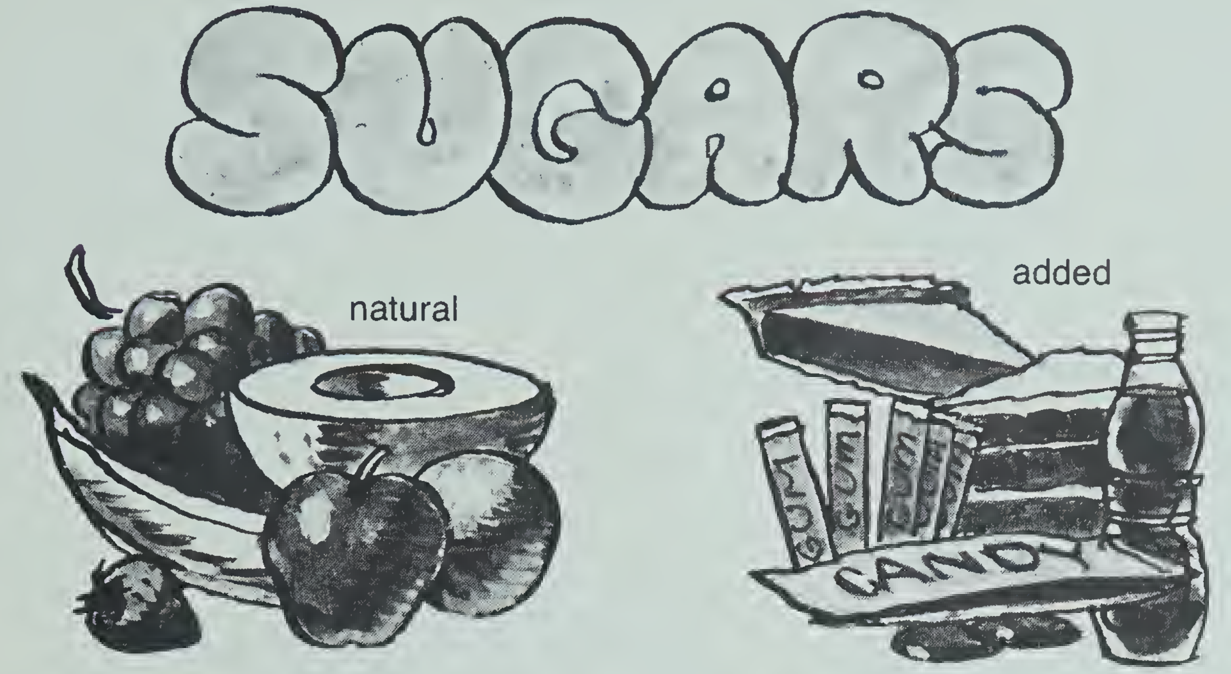
A. Shape the aluminum foil into a small cup.

B. Put the sugar into the aluminum cup. Hold the aluminum cup with the tongs, and heat it over the flame. As you heat the sugar, observe its color, texture, and odor. Continue heating until the sugar turns black.

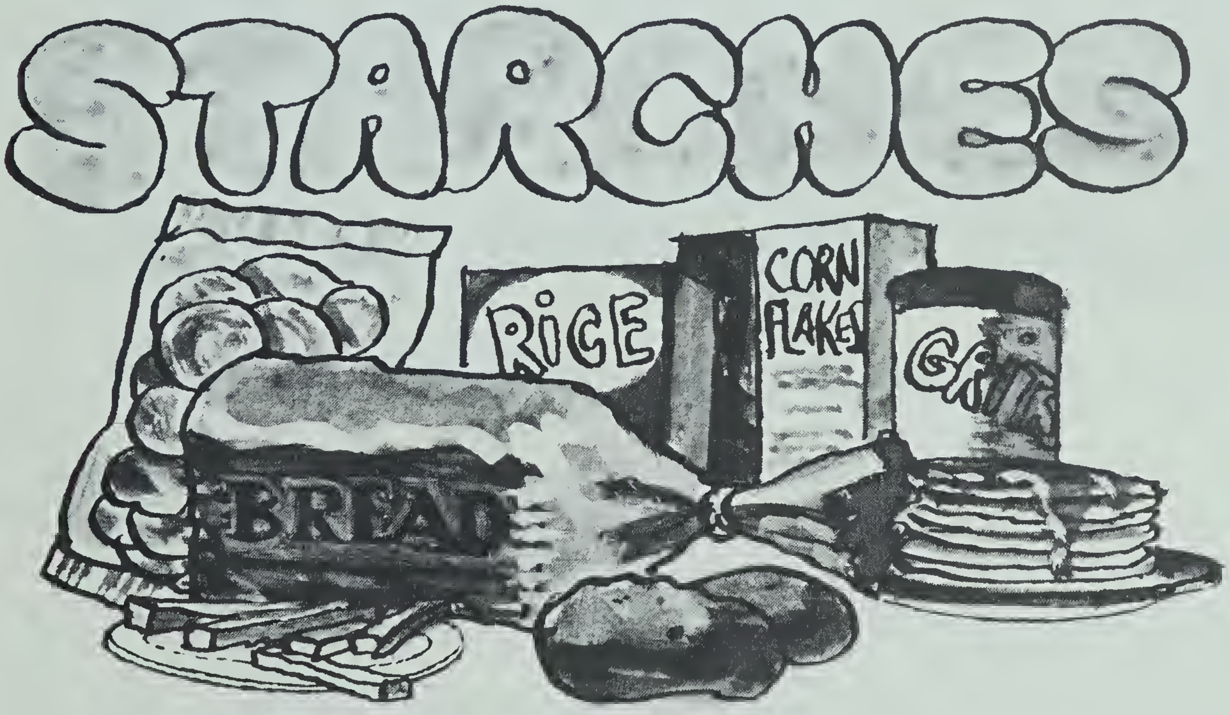
- 2–6. When the sugar was first heated, what happened to the color, texture, and odor of the sugar?

- 2–7. What does the black color show sugar contains?

As the sugar burned, it gave off energy in the form of heat. This same energy in sugar is released in your body after you eat it. Sugars are found naturally in fruits and some vegetables. But most of the sugar in your diet comes from foods to which sugar has been added. The energy from sugar is used to carry out the bodily functions of growing, moving, keeping warm, and so on.



The other carbohydrate, starch, is found in many kinds of foods. Starches also contain energy that can be released inside your body and used.



- 2–8. What are three foods in your diet that are high in sugars or starches?

★ **2–9. What do carbohydrates provide for your body, and how is what they provide used?**

FATS

Fats are the second important food group. They are used for energy by your body when the supply of carbohydrates is used up. A teaspoon of fat contains more than twice as much energy as a teaspoon of either carbohydrate or protein. Dairy products are good sources of fats. Fatty foods add flavor to your diet and have some of the vitamins, such as A, D, E, and K, that you need.

★ 2–10. List two ways your body uses fats.

- 2–11. Name three foods you eat that are good sources of fats.

PROTEINS

Proteins are the third important group of foods. After water, the next most abundant substance in your body is protein. Your body contains about 2000 different kinds of proteins. Proteins supply the materials needed for building new cells and repairing old ones. Your hair, fingernails, cartilage, skin, muscles, enzymes, and digestive juices are mostly protein.

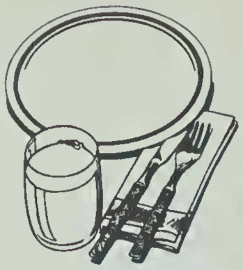
Good sources of proteins are lean meats, fish, poultry, milk, and eggs. Some vegetables, such as dried beans and peas and soybeans, are also good sources of protein.

- 2–12. Name three foods you eat that are good sources of protein.

Proteins are an essential part of everyone's diet. The less food you eat, the larger the percentage of protein you need. Lack of protein during growth periods can cause serious damage to parts of the body including the brain. So proteins are especially important for growing children and teenagers.

Actually, very few foods contain only one of the nutrient groups. Steak, for instance, is high in protein and also high in fat. Cereal is high in carbohydrate but also contains some fat and some protein.

★ **2–13. Why should you eat protein-rich foods such as milk, lean meat, fish, and soybeans?**



Activity 3
Food Record

Do you know how much you eat and drink in an average day? Copy the chart in Figure 3–1 into your notebook. Record in it everything you ate and drank yesterday. Don't forget to put down the amounts. You may have to estimate the amounts of some foods. Don't forget snacks and chewing gum.

FOOD RECORD

Name ______________________ Date ____________

FOOD	AMOUNT (serving size)	FOOD CALORIES	PROTEIN (grams)	MINERALS		VITAMINS				
				Calcium (mg)	Iron (mg)	A (I.U.)	B_1 (mg)	B_2 (mg)	Niacin (mg)	C (mg)
Breakfast										
Lunch										
Supper										
Snacks for day										

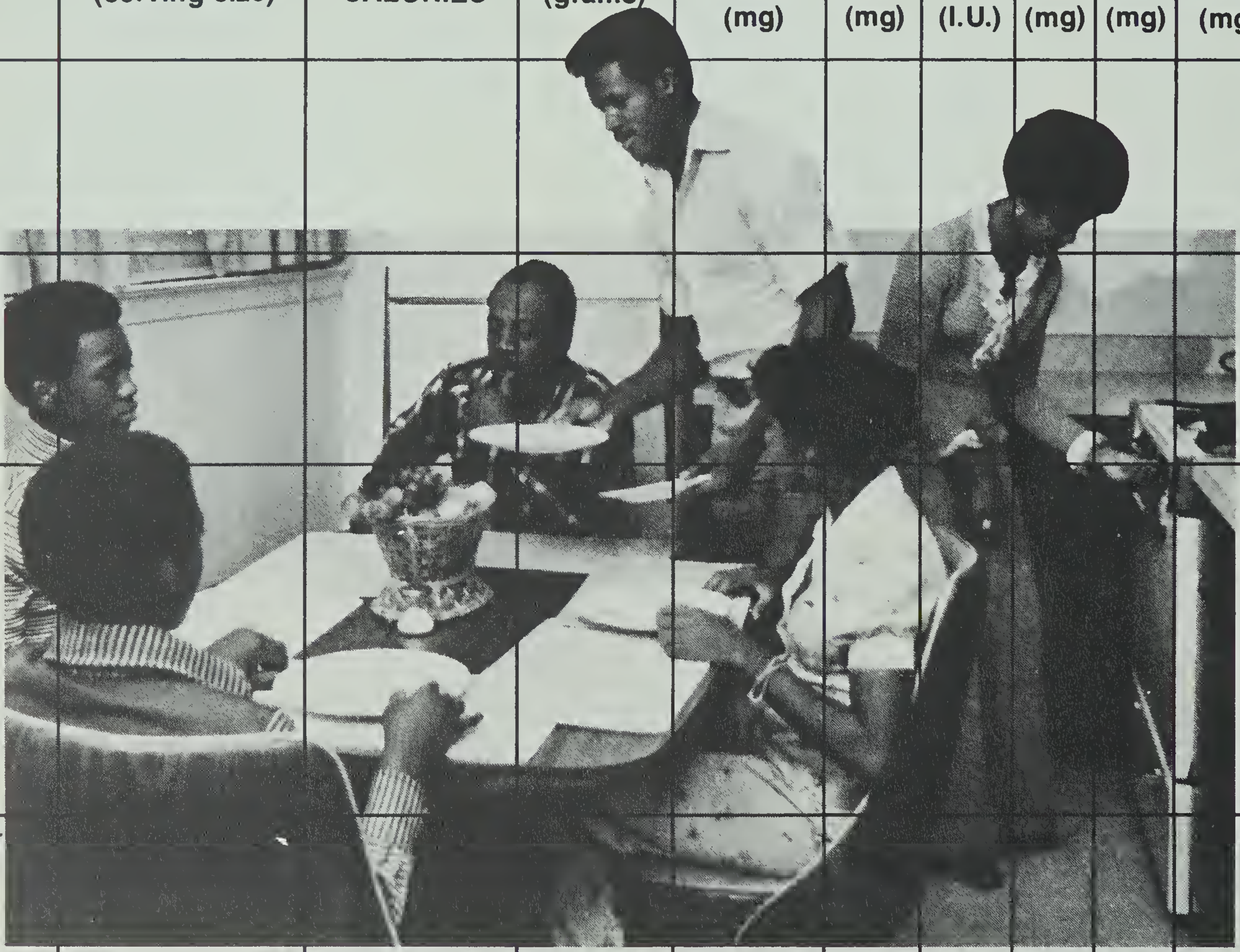


Figure 3–1

You'll use the first two columns of the chart for this activity and the other columns for Activities 4 and 5. The chart in Figure 3–2 is a list of all the food eaten in one day by Donna Cole.

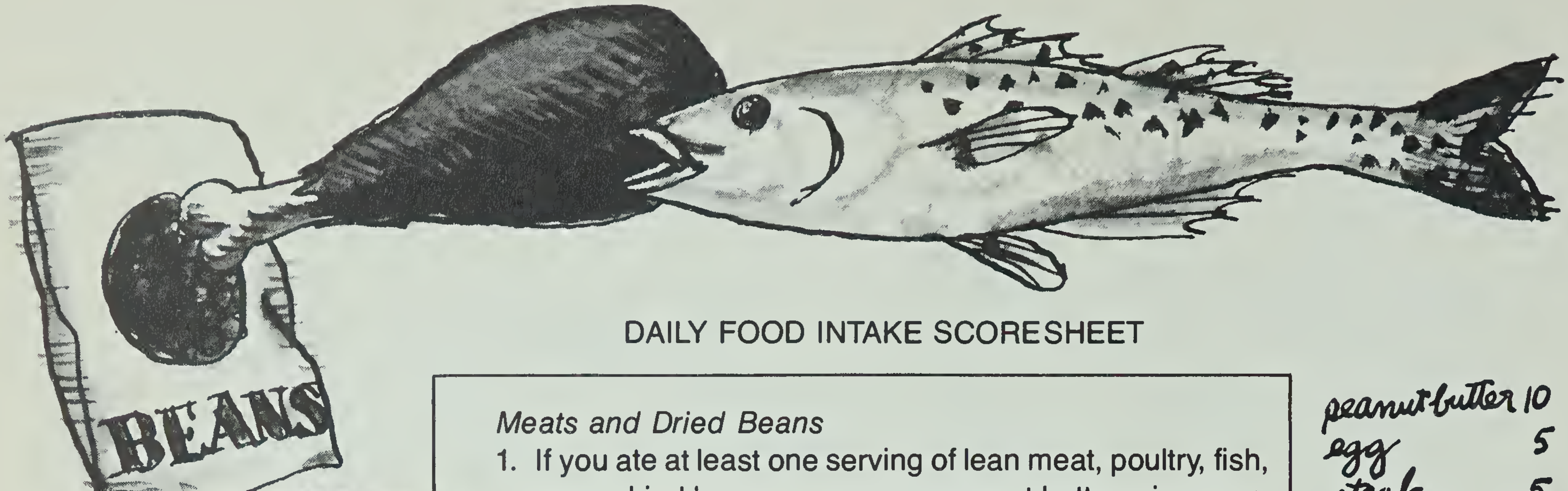
FOOD RECORD

Name Donna Cole
Date 3/1

FOOD	AMOUNT (serving size)	FOOD CALORIES	PROTEIN (grams)	MINERALS		VITAMINS				
				Calcium (mg)	Iron (mg)	A (I.U.)	B_1 (mg)	B_2 (mg)	Niacin (mg)	C (mg)
Breakfast										
Orange juice	4 oz									
Toast, whole wheat	2 slices									
Butter	1 tablespoon									
Milk, whole	8 oz									
Egg, poached	1									
Lunch										
Peanut butter and jelly sandwich	1									
Milk, whole	8 oz									
Chocolate Cake	1 piece									
Supper										
Tossed salad	1 cup									
Salad dressing	1 tablespoon									
Potato, baked	1 medium									
Sour Cream	1 tablespoon									
Steak	4 oz									
Green beans	½ cup									
Lemon Meringue pie	1 piece									
Chocolate milk	8 oz									
Snacks for day										
Soft drink	12 oz									
Chocolate Chip cookies	4									
Apple	1 large									
Potato chips	20									

Figure 3–2

When you've made your record for a whole day, you're ready to score yourself using the Daily Food Intake Scoresheet in Figure 3 – 3 (next page). Donna's score is shown at the right of the scoresheet.



DAILY FOOD INTAKE SCORESHEET

Meats and Dried Beans

1. If you ate at least one serving of lean meat, poultry, fish, eggs, dried beans or peas, or peanut butter, give yourself 10 points. Add 5 points for each additional serving, up to a total of 20 points.

peanut butter	10
egg	5
steak	5
	20 pts.

Fruits and Vegetables

2. If you had at least one serving of orange or grapefruit, cantaloupe, strawberries, peppers, broccoli, mango, or brussel sprouts, give yourself 10 points. Give yourself another 10 points if you had any other green or a deep yellow vegetable. Add 5 points for each additional fruit or vegetable, up to a total of 30 points.

orange juice	10
green beans	10
apple	5
potato	5
	30 pts.

Dairy Foods

3. Give yourself 10 points for the first two glasses of milk and 5 points for each additional glass. Add 5 points for cheese, cream, ice cream, sour cream, or yogurt, up to a total of 30 points.

3 glasses of milk	25
sour cream	5
	30 pts.

Grain Foods

4. Give yourself 5 points for each serving of bread, cereal, rice, spaghetti, noodles, cakes, or cookies up to a total of 20 points.

toast	5
bread	5
cake	5
cookies	5
	20 pts.

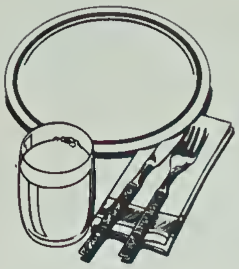
Total 100 pts.

Figure 3–3

- 3–1. What is your total score for yesterday?

If you don't have at least 65 points and some points on each line and if the day was a typical one for you, you probably should think about changing your diet. You are missing some of the basic foods you need for good health.

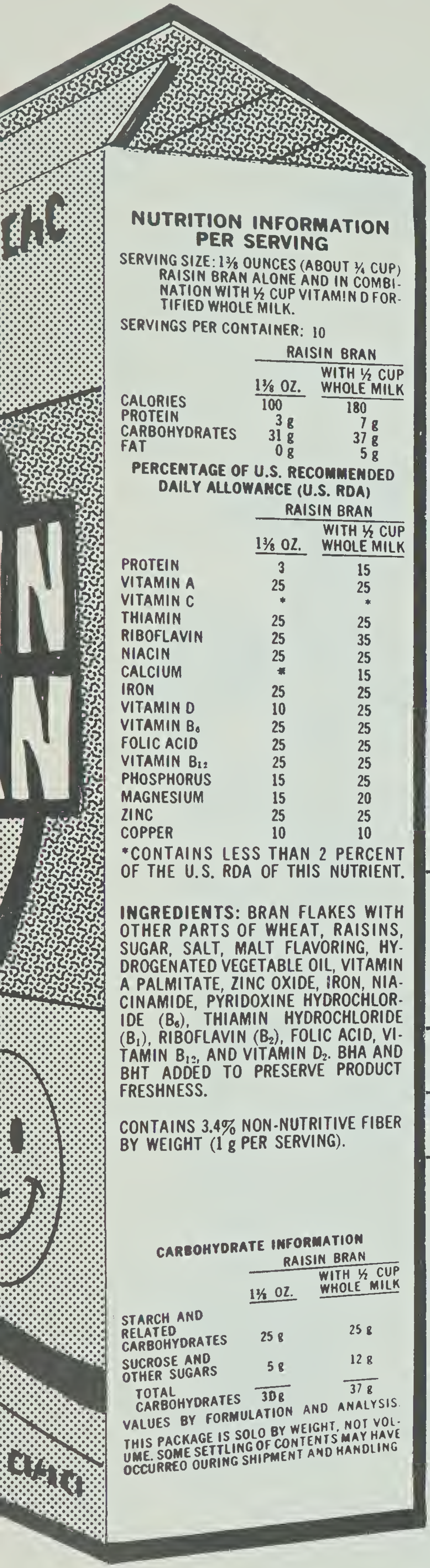
- 3–2. What, if anything, seems to be missing from your diet?



Activity 4

Feeling Full Is Not Enough

A balanced diet means that you eat enough, but not too much, of the major nutrients (fats, proteins, and carbohydrates) and the right amount of all the necessary vitamins and minerals. At least one serving of fats, proteins, and carbohydrates is needed daily by almost everyone.



NUTRITION INFORMATION PER SERVING

SERVING SIZE: 1⅜ OUNCES (ABOUT ¾ CUP) RAISIN BRAN ALONE AND IN COMBINATION WITH ½ CUP VITAMIN D FORTIFIED WHOLE MILK.

SERVINGS PER CONTAINER: 10

	RAISIN BRAN	
	1⅜ OZ.	WITH ½ CUP WHOLE MILK
CALORIES	100	180
PROTEIN	3 g	7 g
CARBOHYDRATES	31 g	37 g
FAT	0 g	5 g

PERCENTAGE OF U.S. RECOMMENDED DAILY ALLOWANCE (U.S. RDA)

	RAISIN BRAN	
	1⅜ OZ.	WITH ½ CUP WHOLE MILK
PROTEIN	3	15
VITAMIN A	25	25
VITAMIN C	*	*
THIAMIN	25	25
RIBOFLAVIN	25	35
NIACIN	25	25
CALCIUM	*	15
IRON	25	25
VITAMIN D	10	25
VITAMIN B_6	25	25
FOLIC ACID	25	25
VITAMIN B_{12}	25	25
PHOSPHORUS	15	25
MAGNESIUM	15	20
ZINC	25	25
COPPER	10	10

*CONTAINS LESS THAN 2 PERCENT OF THE U.S. RDA OF THIS NUTRIENT.

INGREDIENTS: BRAN FLAKES WITH OTHER PARTS OF WHEAT, RAISINS, SUGAR, SALT, MALT FLAVORING, HYDROGENATED VEGETABLE OIL, VITAMIN A PALMITATE, ZINC OXIDE, IRON, NIACINAMIDE, PYRIDOXINE HYDROCHLORIDE (B_6), THIAMIN HYDROCHLORIDE (B_1), RIBOFLAVIN (B_2), FOLIC ACID, VITAMIN B_{12}, AND VITAMIN D_2. BHA AND BHT ADDED TO PRESERVE PRODUCT FRESHNESS.

CONTAINS 3.4% NON-NUTRITIVE FIBER BY WEIGHT (1 g PER SERVING).

CARBOHYDRATE INFORMATION

	RAISIN BRAN	
	1⅜ OZ.	WITH ½ CUP WHOLE MILK
STARCH AND RELATED CARBOHYDRATES	25 g	25 g
SUCROSE AND OTHER SUGARS	5 g	12 g
TOTAL CARBOHYDRATES	3D g	37 g

VALUES BY FORMULATION AND ANALYSIS.

THIS PACKAGE IS SOLO BY WEIGHT, NOT VOLUME. SOME SETTLING OF CONTENTS MAY HAVE OCCURREO OURING SHIPMENT AND HANDLING

The U.S. Recommended Daily Allowances (U.S. RDA) give the amounts of various nutrients needed by most people in the United States. The amounts of each nutrient vary with age and sex but are usually the highest amounts required by a healthy person. Also, they are at least twice the amount needed to avoid disease from the lack of a particular nutrient.

- 4–1. What information can you get from the U.S. RDA?

Figure 4–1 shows the current U.S. RDA for some important nutrients for people 14–18 years old. Other nutrients are not listed. However, if you eat foods that contain the basic nutrients listed, you're probably getting enough of the others.

Most U.S. RDAs are given in grams (g) and milligrams (mg). One gram equals 1000 milligrams. Some nutrients are found in very small amounts, so they are measured in International Units (I.U.), a unit established by a committee of scientists from around the world. An International Unit is usually smaller than a millionth of a gram.

- 4–2. What is the U.S. RDA for iron for you?

- 4–3. What percentage of the U.S. RDA for iron does one serving of the cereal shown in Figure 4–1 provide?

RECOMMENDED DAILY DIETARY ALLOWANCES

PERSON (sex)	AGE (years)	PROTEIN (g)	MINERALS		VITAMINS				
			Calcium (mg)	Iron (mg)	A (I.U.)	B_1 (mg)	B_2 (mg)	Niacin (mg)	C (mg)
Male	14–18	60	1400	18	5000	1.5	1.5	20	55
Female	14–18	55	1300	18	5000	1.2	1.5	16	50

Figure 4–1

Look at Figure 4–2. It shows how well most people in the United States do in getting the U.S. RDA for several nutrients. If they get enough, the percentage is 100. A percentage of 80 means those people get, on the average, about 80% of the recommended daily allowance of that nutrient.

- 4–4. According to Figure 4–2, all people on the average get enough of which nutrient?

NUTRIENTS IN DIETS IN UNITED STATES

AVERAGE PERCENTAGE U.S. RDA RECEIVED BY MALES

Age (years)	Protein	Calcium	Iron	Vitamin A	Vitamin C
0–11	100%	90–100%	70–100%	100%	100%
12–19	100%	80–100%	70–100%	100%	100%
20–74	100%	80–100%	100%	100%	100%
75 & over	100%	70%	100%	90%	90%

AVERAGE PERCENTAGE U.S. RDA RECEIVED BY FEMALES

Age (years)	Protein	Calcium	Iron	Vitamin A	Vitamin C
0– 11	100%	70–100%	70– 80%	100%	100%
12– 19	100%	70%	70%	90%	100%
20– 74	100%	70%	70–100%	90%	100%
75 & over	100%	70%	90%	80%	100%

Figure 4– 2

Most people in the United States overeat. But overeating does not mean they are getting all the nutrients their bodies need. In an average high school class, about fifty to sixty percent of the students have a nutritional problem.

- 4– 5. According to Figure 4– 2, which two nutrients do teenagers most often lack in their diets?
- 4– 6. Which sex is more likely to lack the most nutrients?

Spotting overweight and underweight people may be easy. But what do you look for to see whether someone has an iron or calcium deficiency?

Usually, people who have a deficiency of some nutrient, such as protein, calcium, iron, or vitamin A, don't know it. Their only physical symptoms may be something such as being tired or getting a lot of colds.

You can figure out what nutrients your diet should contain and whether or not there is enough of them in the food you eat. Get the *Diet Data* booklet that goes with this minicourse. Find the Nutrient Values of Foods chart in the booklet and use it to answer Questions 4–7 to 4–9.

- 4–7. Name two foods which will give you the U.S. RDA for vitamin C in one serving. (The U.S. RDA for vitamin C is 50 or 55 mg).

- 4–8. Name three foods for which one serving gives the U.S. RDA for vitamin A. (The U.S. RDA for vitamin A is 5000 I.U.).

It isn't easy to get enough iron every day. One combination of foods that would give the U.S. RDA for iron is 6 oz (171g) of liver and one cup (180g) of spinach.

- 4–9. What is another combination of two or three foods that would give at least 15 mg of iron?

Get the Food Record you made for Activity 3 (page 12). Use the Nutrient Values of Foods chart in the *Diet Data* booklet to fill in the protein, mineral, and vitamin content for the foods listed in your food record. When you have completed your entries, add up all columns.

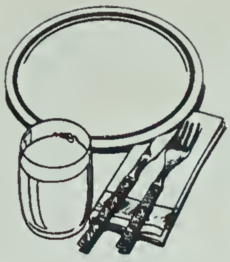
- 4–10. For which nutrients did you get more than the recommended daily allowance?

- 4–11. For which nutrients did you get less than the recommended daily allowance?

The recommendations are only averages and your totals would probably vary from one day to the next. However, if you are much lower or much higher for any of the nutrients, you should consider altering your eating habits.

- 4–12. List the nutrients required for a balanced diet.

★ **4–13. How does your diet differ, if at all, from a balanced diet?**



Activity 5

Food Energy—How Much Do You Get?

Almost all foods contain energy. Some foods contain more than others. Your body "burns" the food you eat much as gasoline is burned in a car engine. From the burning you get energy to grow, to move, to play, to carry on your body functions, and even to think.

To measure some of the energy stored in food, you will need the following materials:

safety goggles
cork stopper
3 pieces of aluminum foil,
  enough to cover cork
needle
3 marshmallows
graduated cylinder
3 test tubes
thermometer, Celsius, 0–110°
test-tube clamp
matches

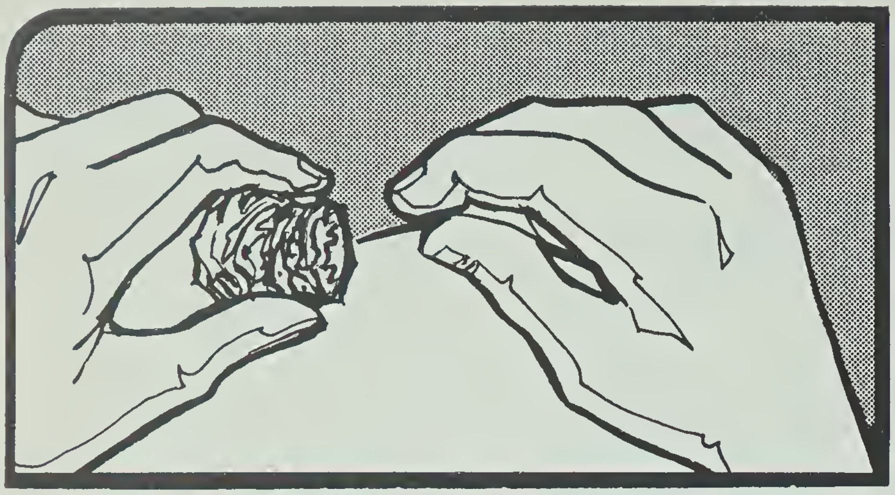
You will need to read a thermometer. If you don't know how to read one, do *Resource Unit 14* now.

Before you begin the investigation, make a table like the one in Figure 5–1 in your notebook. You will use it to record your data.

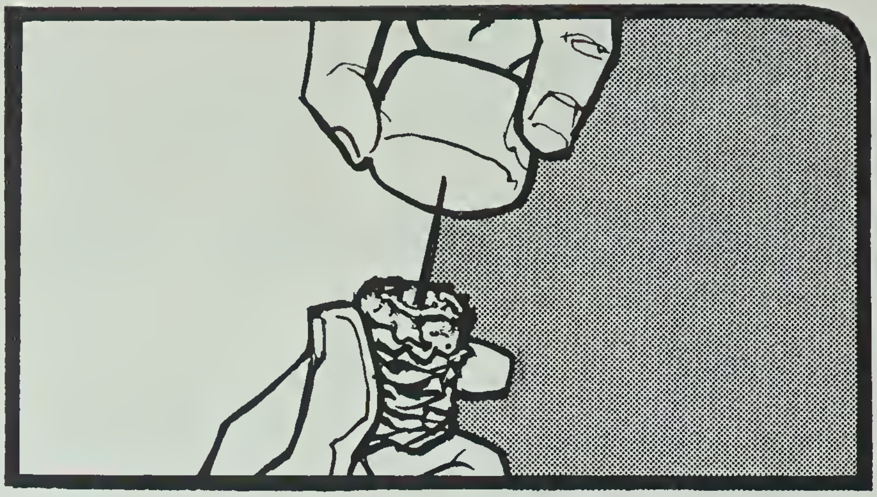
MARSHMALLOW ENERGY

MARSHMALLOW TRIAL	TEMPERATURE OF WATER AT START	TEMPERATURE OF WATER AT END	DIFFERENCE IN TEMPERATURE
1	(?)	(?)	(?)
2	(?)	(?)	(?)
3	(?)	(?)	(?)
Average Difference in Temperature			(?)

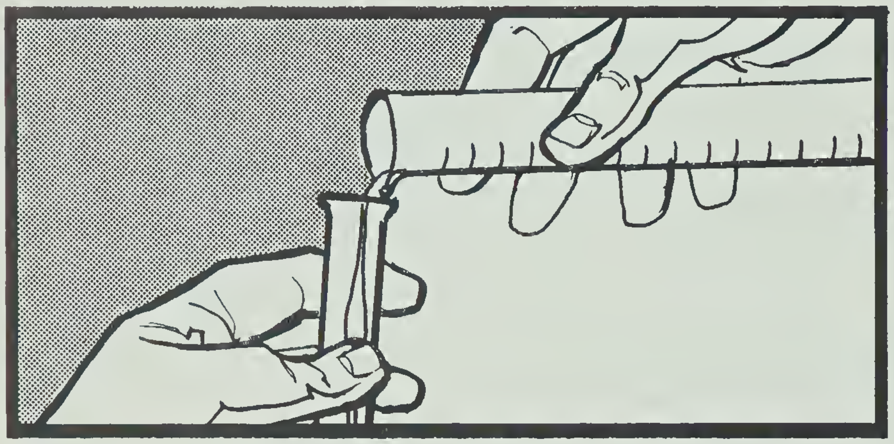
Figure 5–1



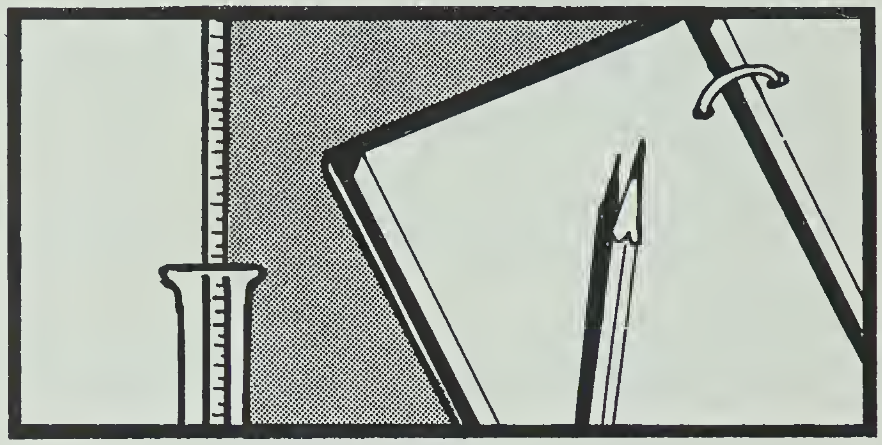
Cover the cork with aluminum foil. Put the needle into the cork.



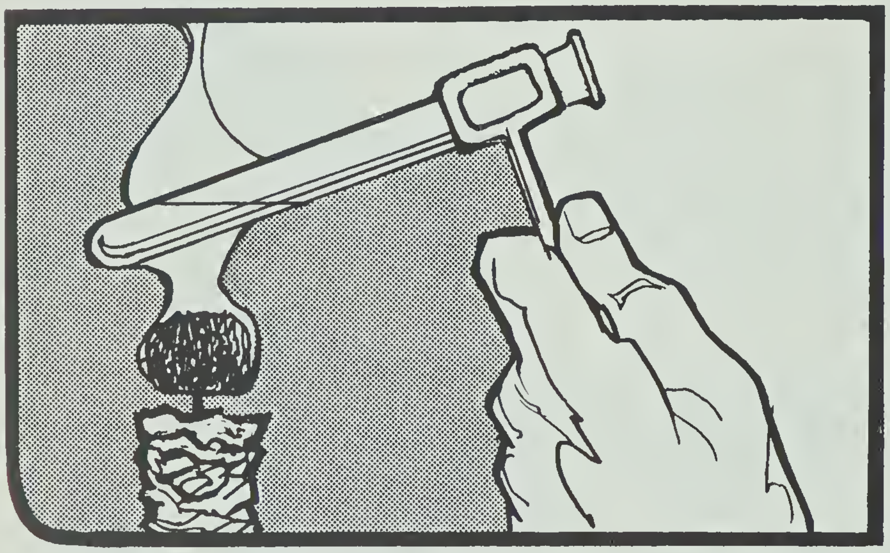
Push the marshmallow onto the needle.



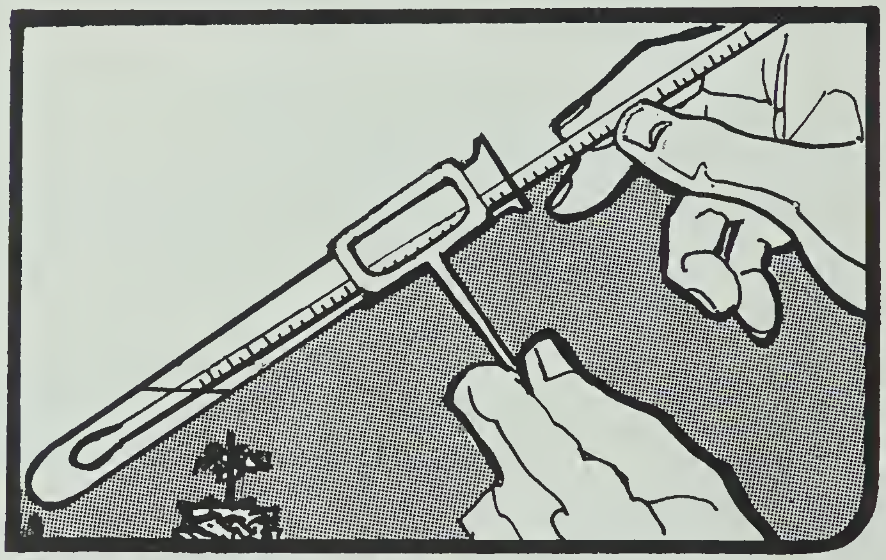
Pour 10 ml of water into the test tube, and measure its temperature.



Record the temperature in the table in your notebook. Remove the thermometer.



Light the marshmallow. Hold the test tube of water over the burning marshmallow. Burn the marshmallow to an ash. If it goes out, relight it.



Record the temperature in your notebook. Repeat the procedure two more times with fresh aluminum foil and marshmallows.

- 5 – 1. Figure out and record the average difference in temperature of the water from before to after burning. (If you don't know how to find the average, read *Resource Unit 1.)*

- 5 – 2. Why should you find the average difference in temperature instead of doing the experiment just once?

Heat energy is measured in terms of *calories* (Figure 5–2). Most foods used by your body produce thousands of regular calories. Thus, a special calorie unit is used for food energy. It is called a *kilocalorie* and is represented by a capital "C." This is the "calorie" used on food packages and in diet tables.

So, now you can find the average heat energy produced by the marshmallows. To find the weight of water, you need to know that 1 millilitre of water weighs 1 gram.

grams of water heated × average difference in temperature of water = regular calories released as heat energy

- 5–3. How many regular calories, on the average, were released by the marshmallows you burned?
- 5–4. How many food calories, on the average, are in your marshmallows? (Hint: Divide the number of regular calories by 1000.)
- 5–5. You really didn't measure all of the heat energy that could come from the marshmallows. What probably happened to the rest of the heat energy?

Only part of the heat from a burning marshmallow heated the water. Some of the heat escaped to the air and some heated the test tube. Also, the marshmallows didn't burn completely. There was some carbon left.

To measure food calories accurately takes special equipment. It allows very little heat to escape, so almost all of the heat energy released from burning food can be measured.

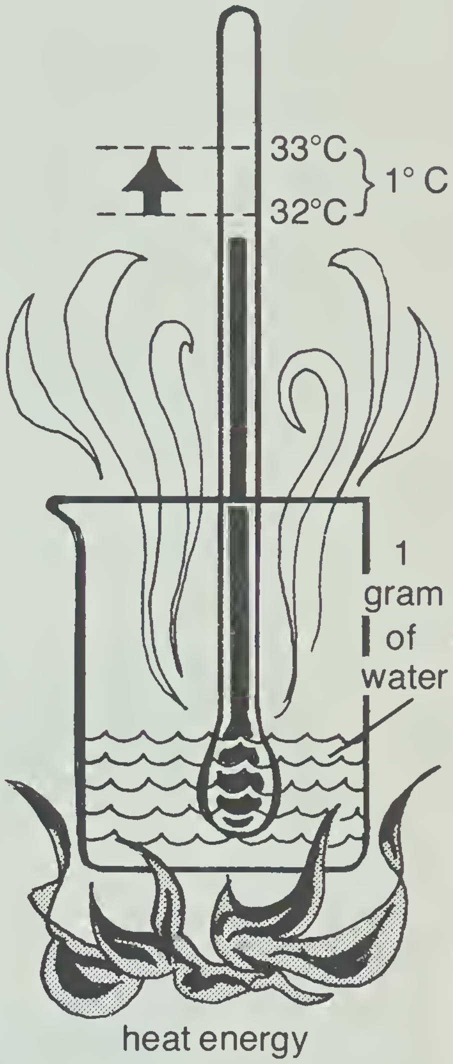
The amount of food energy in (that can be produced by) different kinds of foods has been determined. As it turns out, fats contain a lot more food energy than proteins or carbohydrates.

one gram of FAT has → 9 food calories

one gram of PROTEIN has → 4 food calories

one gram of CARBOHYDRATES has → 4 food calories

A REGULAR CALORIE is the amount of heat energy needed to raise the temperature of 1 gram of water 1° Celsius.



A FOOD CALORIE is equal to 1000 regular calories; sometimes called a KILOCALORIE.

Figure 5–2

The number of calories in a food varies from one food to the next. Figure 5–3 contains a list of foods that are considered either high or low in food calories.

FOODS AND CALORIES

LOW IN CALORIES	**HIGH** IN CALORIES
Seafood: fish, shrimp, crab, oysters, scallops, clams	*"Fatty" meats:* steak, ham, pork
Poultry: chicken, turkey	*"Starchy" vegetables and fruits:* corn, dried beans, peas, dried fruits (raisins, prunes, etc.), potatoes, sweet potatoes
"Watery" vegetables and fruits: grapefruit, squash, oranges, cabbage, lettuce, celery, cucumbers, tomatoes, plums	*Nuts:* almonds, walnuts, pecans, cashews, peanuts
Fresh berries: blueberries, cranberries, cherries, mulberries	*"Sweets":* candy, cake, pie, ice cream, sodas, syrups, jellies, pastries, cookies, chocolate
Skim milk products and unsweetened fruit juices: white cheeses, yogurt, orange juice, skim milk	*Flour products:* pancakes, waffles, bread, rolls, muffins, doughnuts
Eggs and egg dishes: scrambled eggs, souffles, omelets	*"Starches":* noodles, rice, macaroni
Gelatin: molded salads, gelatin desserts	*Snack foods:* crackers, potato chips, potato sticks, corn chips, pretzels

Figure 5–3

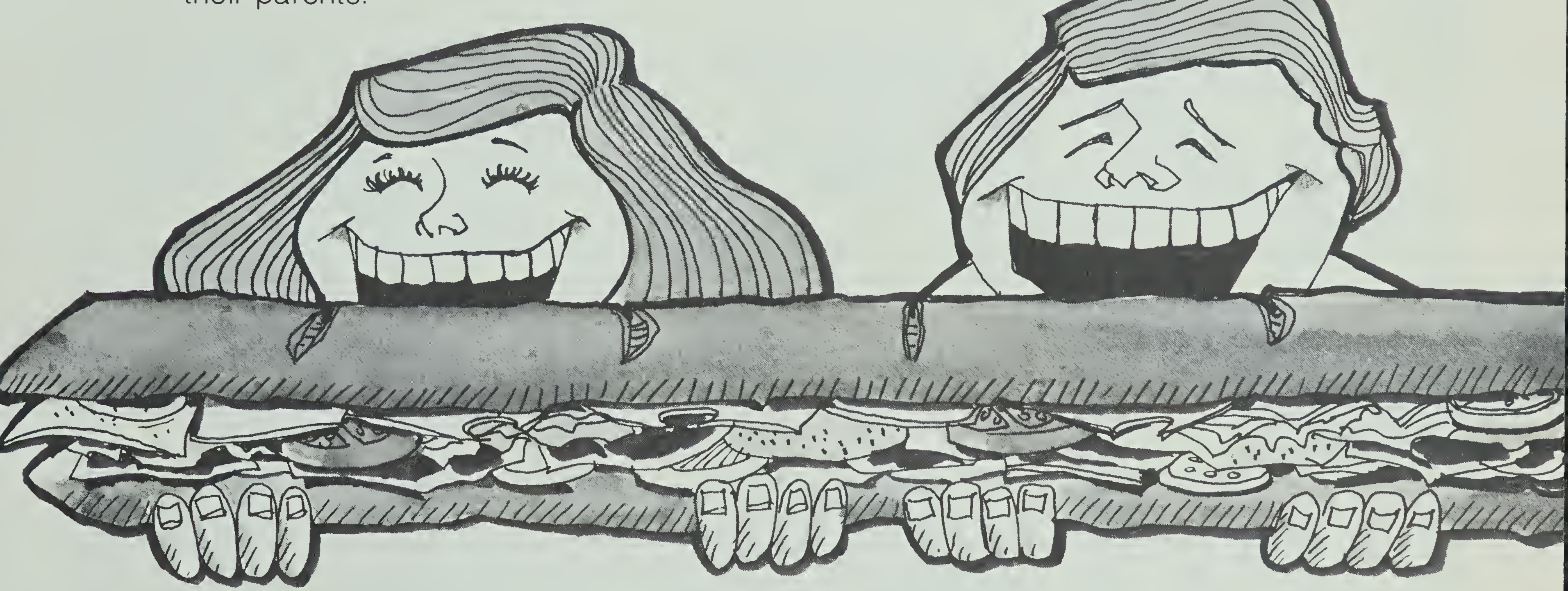
★ 5–6. In the following list, which are the low calorie foods? The high calorie foods?

a. spaghetti
b. string beans
c. grapes
d. trout
e. pastry
f. tomato juice
g. melon
h. ice cream soda

To decide whether or not foods are high or low in calories, the amount of the food eaten must also be considered. One piece of candy has only ten food calories. But most people don't stop at just one piece of candy. Some people get "addicted" to foods containing large amounts of sugar or flour. These foods are high in calories and may cause health problems if large amounts are eaten for years.

The calories needed varies with age, sex, weight, height, and physical activity. Teenagers are usually active and growing very fast, so their nutritional needs are high. A teenage boy may grow as much as four inches (ten centimetres) in height and gain as much as fifteen pounds (five and a half kilograms) in a year. A teenage girl's growth is usually not as great, but it's still quite high.

• 5–7. List two reasons why teenagers might require more food than their parents.



To maintain your weight and supply energy for growth, you require 15–20 food calories for each pound, or 30–40 calories for each kilogram, you weigh. The more active you are, the more food calories you need.

• 5–8. What is your present weight?

★ 5–9. About how many food calories do you need daily to stay at your present weight?

How many food calories do you take in during a normal day? To find out, you need your Food Record from Activity 3 and the Nutrient Values of Foods chart in the *Diet Data* booklet.

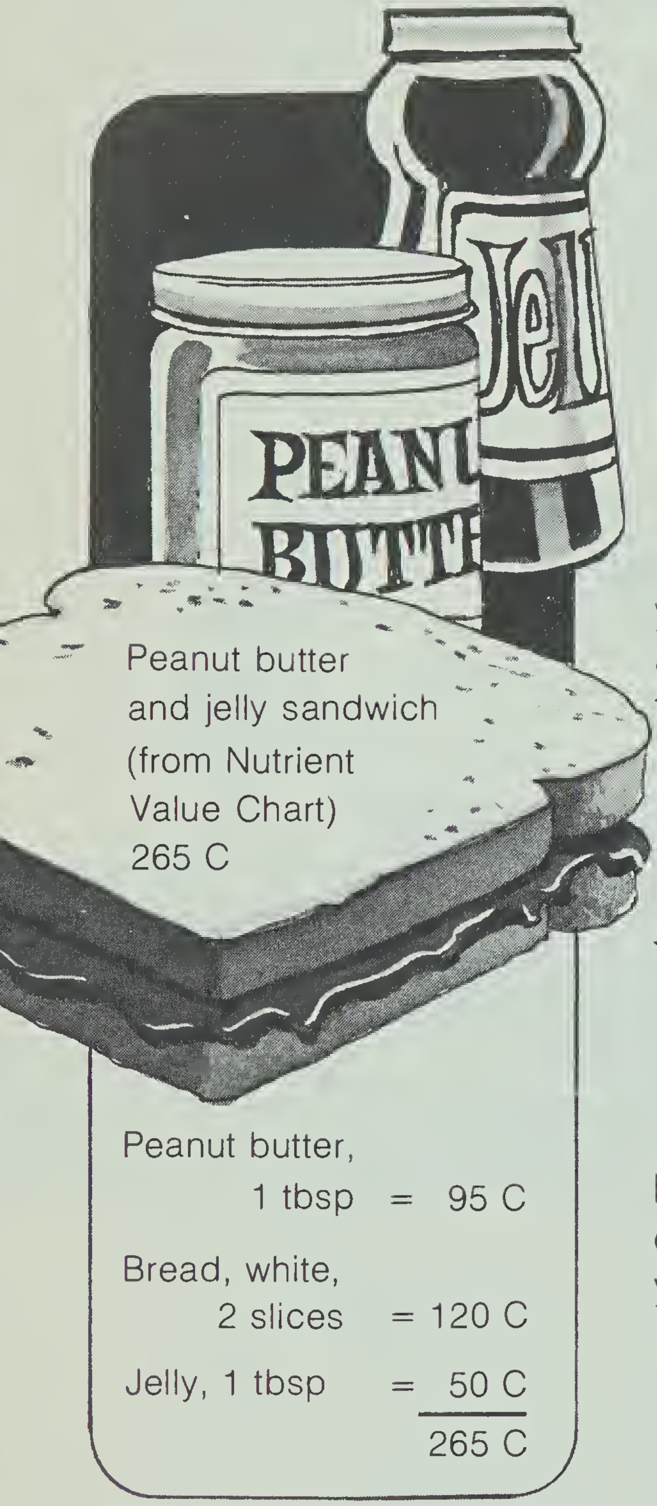
If you can answer the next three questions, you're ready to use the *Diet Data* booklet with your Food Record.

- 5–10. The first entry in the Nutrient Values of Foods chart shows that a boiled egg has 80 food calories. How many food calories would 2 boiled eggs provide?

- 5–11. According to the Nutrient Values of Foods chart, one cup (244 g) of whole milk has 160 food calories. How many food calories are in ½ cup (122 g) of milk?

- 5–12. How many food calories are there in one medium banana?

Some combination foods have been listed for you in the Nutrient Values of Foods chart. But there will probably be others you eat that are not listed. In these cases, you'll have to figure out the calories in each of the ingredients. Here's an example of how that's done. Look at Figure 5–4.



Peanut butter and jelly sandwich (from Nutrient Value Chart) 265 C

Peanut butter, 1 tbsp = 95 C
Bread, white, 2 slices = 120 C
Jelly, 1 tbsp = 50 C
265 C

Figure 5–4

Using the Nutrient Values of Foods chart, fill in the calories column of your Food Record. If you have trouble figuring the food calories for any of the foods, ask your teacher for help. Figure the total number of food calories you had for the day.

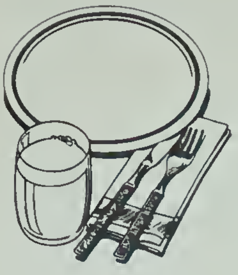
- 5–13. How many food calories did you take in during the whole day?

★ **5–14. Do you take in more, less, or just about as many calories as you need to maintain your present weight?** (See your answer to Question 5–9.)

On the day of your record, the number of food calories you ate may have been higher or lower than usual for you. Keeping a record of everything you eat for more than one day will give you a better idea of your normal daily calorie consumption.

- 5–15. If you want to reduce the calories in your diet, which would be better for an afternoon snack, a cup of fresh fruit or a piece of chocolate pie?

- 5–16. List ten of your favorite foods and snacks. Use the chart in Figure 5–2 or the Nutrient Values of Foods chart to classify each as high or low in calories.



Activity 6
A Poor Insurance Risk

Being overweight is more than a problem of being unattractive in the eyes of society. It also increases the risk of getting certain illnesses. These illnesses include diabetes, high blood pressure, and diseases of the heart, arteries, and gallbladder.

- 6–1. List four diseases that overweight people run a greater risk of developing than people of normal weight.

In addition to illness, insurance companies have collected data that show that overweight people do not live as long as people who are normal weight. Figure 6–1 shows different percentages of overweight. You can see how the risk of early death for people who are overweight is increased as compared to the risk for people of normal weight.

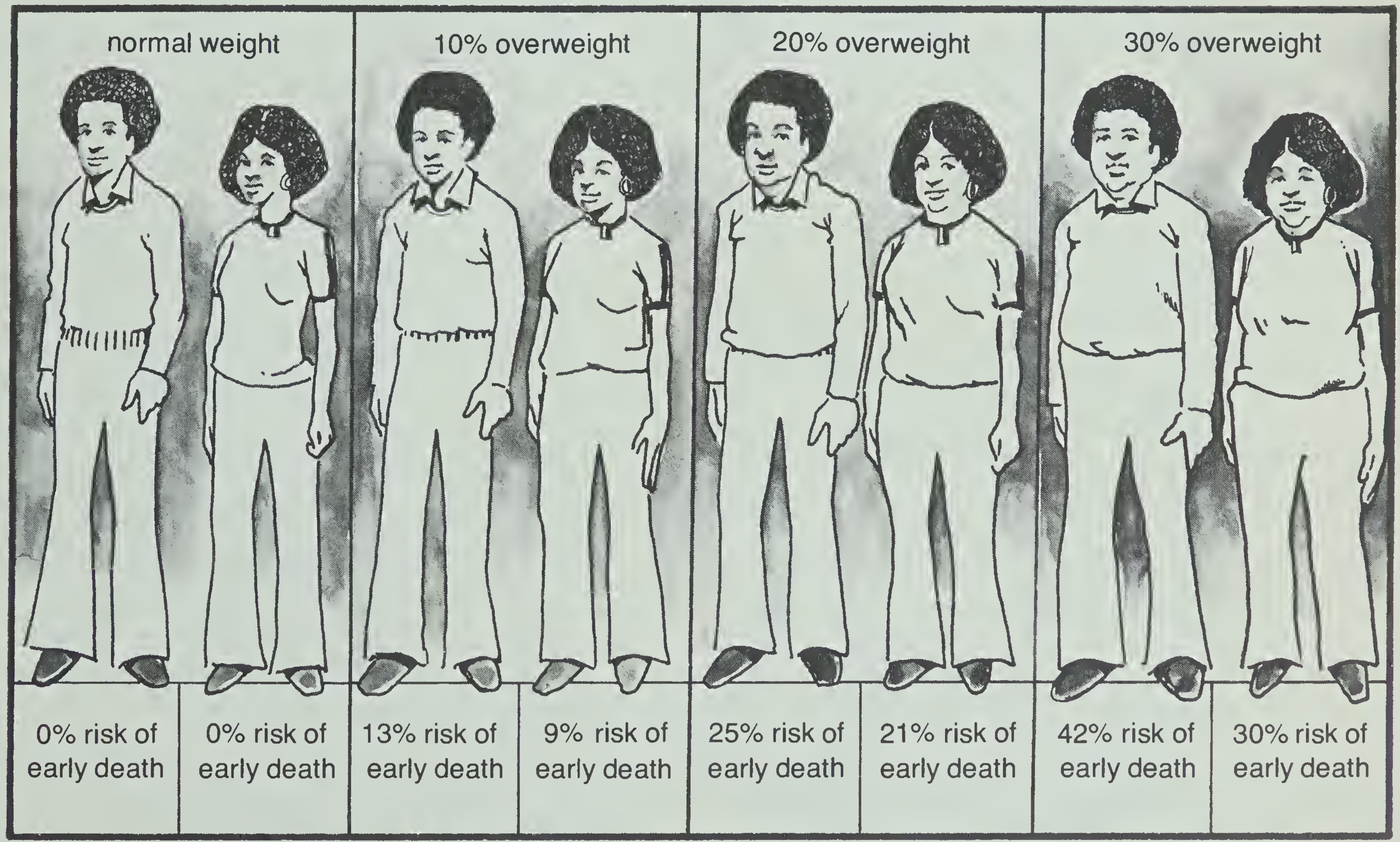


Figure 6–1

SKINFOLD MEASURE

TRIAL	SKINFOLD THICKNESS (in mm)
1	
2	
3	
Average	

Figure 6–2

- 6–2. Who has the greater risk of early death from being overweight, a man or a woman?

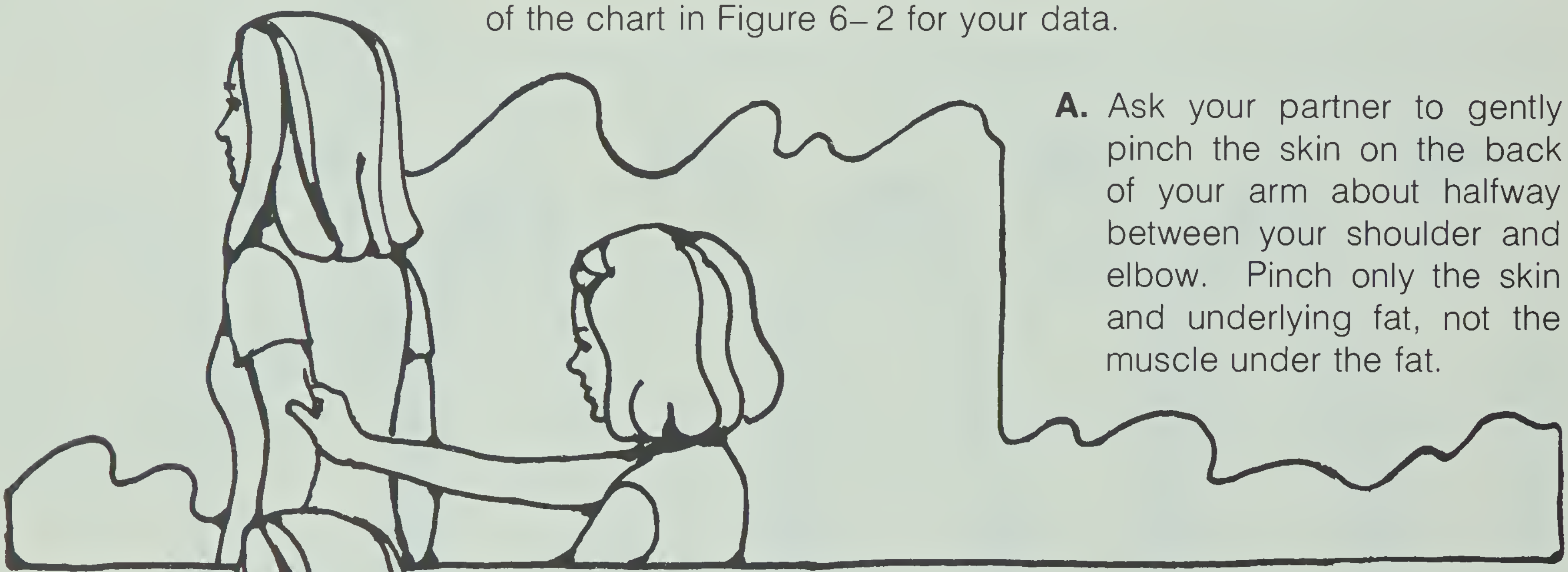
A man who is ten percent overweight has a thirteen percent greater risk of early death than a man who is the normal weight for his height and body build.

- 6–3. If a man is twenty percent overweight, how much is his risk of dying early increased?

People who are more than twenty percent heavier than the ideal weight for their height are considered bad risks by insurance companies. Some companies won't even sell them life insurance at any price. How about you? Are you a poor risk or a good risk?

Measuring body fat isn't easy. But it can be estimated. Most of the body's fat is stored between skin and layers of muscle. An overweight person has more fat under the skin than a person of normal weight. When you pinch your skin, you get a double layer of fat and a double layer of skin.

To get an idea if you are *obese* (fat), measure a fold of fat and skin. You'll need a classmate to help you, "a skinfold measurer," and a copy of the chart in Figure 6–2 for your data.



A. Ask your partner to gently pinch the skin on the back of your arm about halfway between your shoulder and elbow. Pinch only the skin and underlying fat, not the muscle under the fat.

B. Have your partner put the skinfold measurer about 1 cm below the pinch of skin and read the scale to the nearest millimetre. Repeat two more times.

Record the readings in your table. Then average your data. If you're not sure how to average, read *Resource Unit 1*.

- 6–4. What is your average skinfold measure in millimetres?

Figure 6–3 lists the minimum skinfold thicknesses according to age. If a person's skinfold measure is that thickness or more, the person is considered obese.

- 6–5. Which sex normally has more body fat?
- 6–6. What is the minimum skinfold thickness for obesity for your age and sex?
- 6–7. Is your skinfold measure above or below the minimum for obesity?

MINIMUM SKINFOLD THICKNESS FOR OBESITY

AGE (years)	MALE MEASURE (millimetres)	FEMALE MEASURE (millimetres)
12	18	22
13	18	23
14	17	23
15	16	24
16	15	25
17	14	26
18	15	27
19	15	27
20	16	28
21	17	28
22	18	28
23	19	28
24	20	28
25	20	29
26	20	29
27	21	29
28	22	29
29	22	29
30– 50	23	30

Figure 6–3

Your skinfold measure gives you an idea if you are obese or not. But remember the instrument you used was not very accurate.

CRASH DIET?

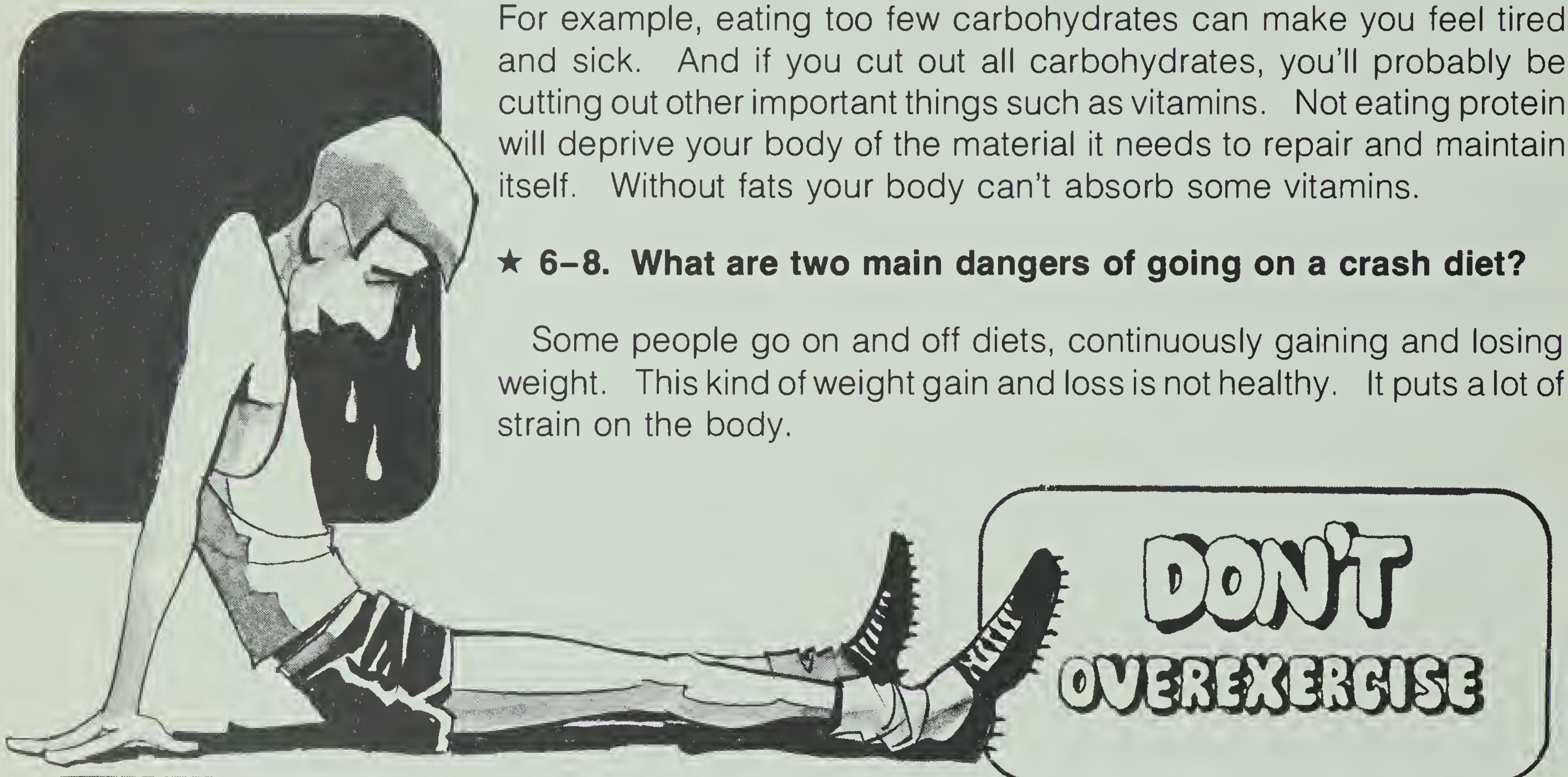
Many overweight people try crash diets to solve their weight problems. On a crash diet, you eat almost nothing or very low calorie foods until you lose weight. Sometimes crash diets work. But, usually, people gain back the weight as soon as they go off the diet.

There are many crash diets. Some require special foods, and some require pills. Going on a crash diet that has you eat only a limited number of foods will probably result in a loss of weight. If the diet foods don't contain all the nutrients needed for a balanced diet, and if you stay on the crash diet for a long time, you can also become ill.

Completely cutting out any one of the major nutrients is dangerous. For example, eating too few carbohydrates can make you feel tired and sick. And if you cut out all carbohydrates, you'll probably be cutting out other important things such as vitamins. Not eating protein will deprive your body of the material it needs to repair and maintain itself. Without fats your body can't absorb some vitamins.

★ 6–8. What are two main dangers of going on a crash diet?

Some people go on and off diets, continuously gaining and losing weight. This kind of weight gain and loss is not healthy. It puts a lot of strain on the body.



DON'T
UNDEREAT

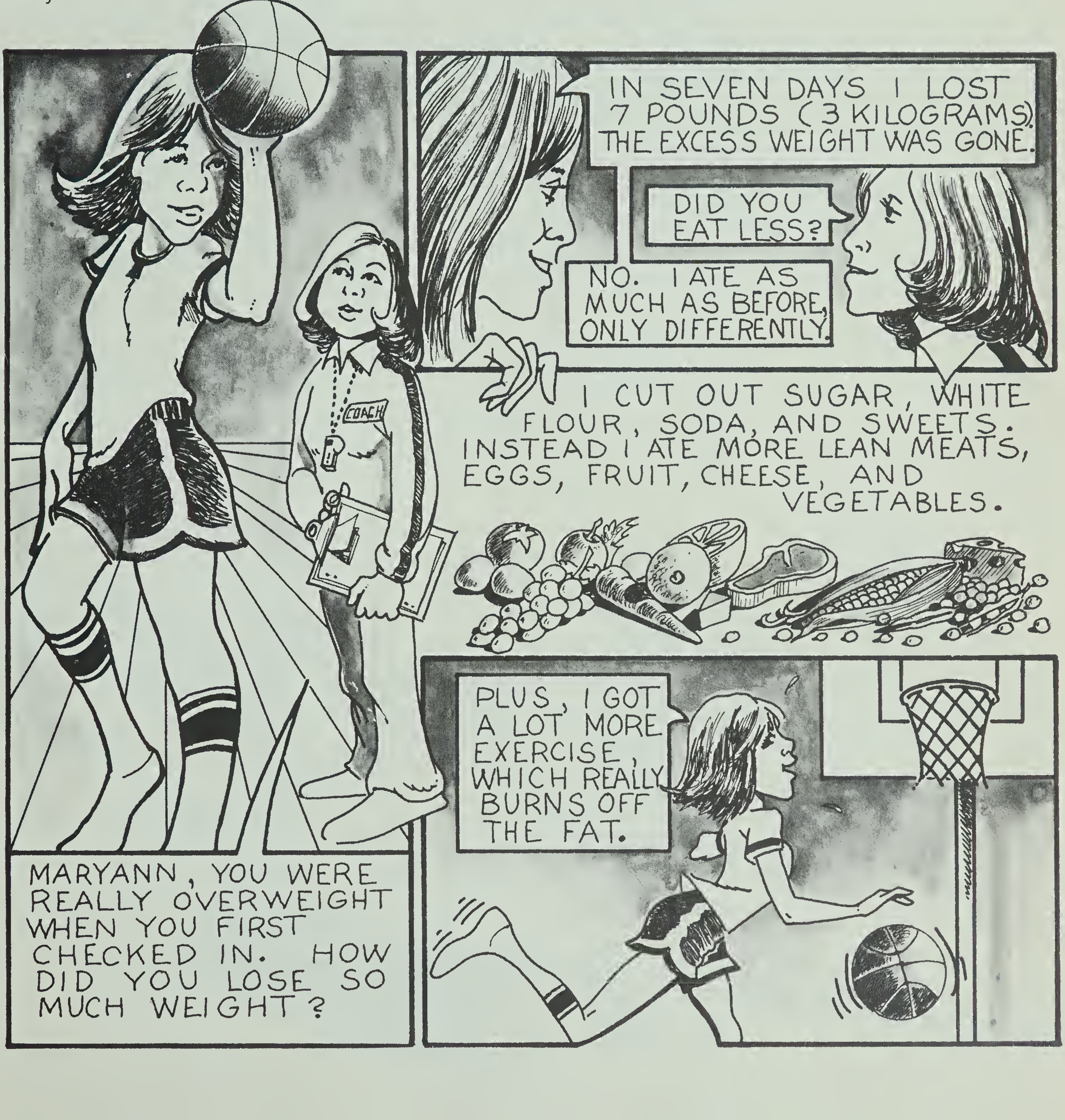
The idea in losing weight is to take in fewer food calories than you use up in your daily activities. Calories do count. But the foods you take in on a low calorie diet should contain all the nutrients you need to stay healthy.

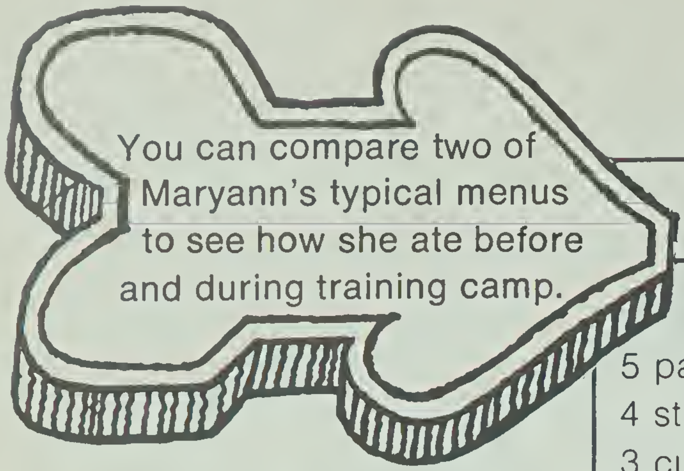
Diet influences the way you look, feel, and act. Good nutrition is the first step toward shiny hair, clear skin and eyes, good teeth, an alert mind, and a generally good feeling.

Activity 7

Calories and the Company They Keep

Many people would like to control their weight, but not everyone knows how to do it sensibly. This activity will help you plan a weight control program for yourself, as Maryann did in the following story.


MARYANN, YOU WERE REALLY OVERWEIGHT WHEN YOU FIRST CHECKED IN. HOW DID YOU LOSE SO MUCH WEIGHT?
COACH
IN SEVEN DAYS I LOST 7 POUNDS (3 KILOGRAMS). THE EXCESS WEIGHT WAS GONE.
DID YOU EAT LESS?
NO. I ATE AS MUCH AS BEFORE, ONLY DIFFERENTLY.
I CUT OUT SUGAR, WHITE FLOUR, SODA, AND SWEETS. INSTEAD I ATE MORE LEAN MEATS, EGGS, FRUIT, CHEESE, AND VEGETABLES.
PLUS, I GOT A LOT MORE EXERCISE, WHICH REALLY BURNS OFF THE FAT.

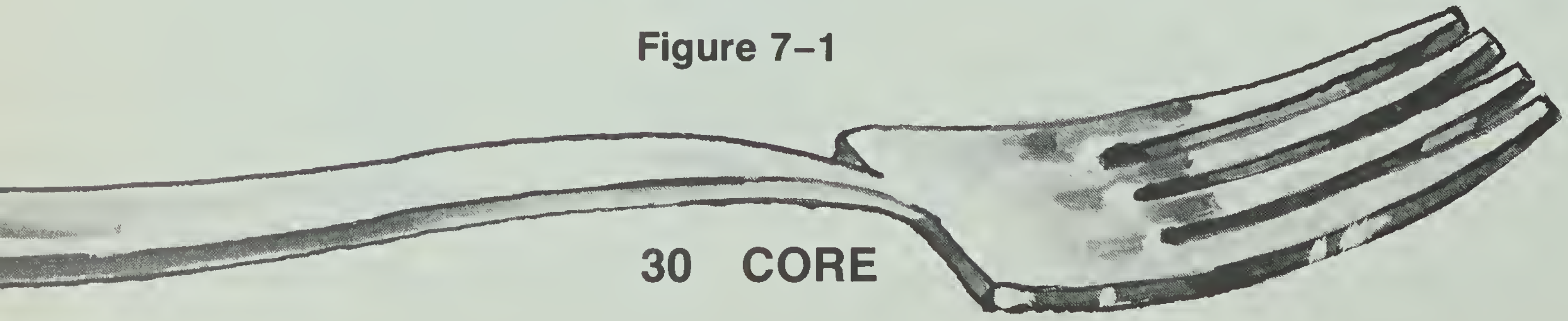


You can compare two of Maryann's typical menus to see how she ate before and during training camp.

MENU

BEFORE TRAINING CAMP	AFTER ONE WEEK
Breakfast 5 pancakes with syrup and butter 4 strips bacon 3 cups (540 g) coffee, cream and sugar	*Breakfast* 2 eggs, poached 2 slices toast with honey 1 cup (245 g) skim milk 1 orange
Snack 1 1 hot roll 1 cup (180 g) coffee, cream and sugar	*Snack 1* ½ cup (113 g) cottage cheese 1 fresh pear
Lunch 3 oz (85 g) hamburger 20 french fries 1 cup (132 g) ice cream 12 oz (369 g) cola	*Lunch* 6 oz (170 g) broiled chicken 1 baked potato 1 apple 2 cups (490 g) skim milk
Snack 2 3 oz (85 g) chocolate candy 12 oz (369 g) cola	*Snack 2* ½ oz (14 g) seedless raisins 1 cup (249 g) pineapple juice
Supper 6 oz (170 g) steak 1 potato, mashed 1 pat (5 g) butter ½ cup (125 g) canned peas 1 cup (256 g) canned fruit cocktail 1 slice pie 1 cup (180 g) coffee, cream and sugar	*Supper* 4 oz (113 g) steak 1 baked potato 1 tbsp (12 g) sour cream ½ cup (125 g) cooked fresh peas 1 cup (41 g) lettuce, shredded vinegar dressing ½ cantaloupe ½ cup (113 g) cottage cheese 1 cup (180 g) plain coffee
Snack 3 24 oz (738 g) cola 10 pretzels	*Snack 3* 1 cup (248 g) lemonade

Figure 7–1



Both menus contain a lot of food, but Maryann was able to lose weight eating the food listed at the right, because it contained less food energy. Measured in food calories, Maryann's food energy intake before training camp was about 4500 food calories a day. After one week in training camp, it was about 2500 food calories. Her daily intake was reduced by 2000 food calories.

- 7–1. Which kinds of foods did Maryann cut down on during training camp?

- 7–2. In training camp, she ate more of which kinds of foods?

While Maryann was taking in fewer calories per day, her body still needed the same number for breathing, circulating blood, keeping at a constant temperature, and so on. The number of calories people need just to stay alive 24 hours is called their *basal metabolic rate.*

The average basal metabolic rate for a person can be estimated as follows:

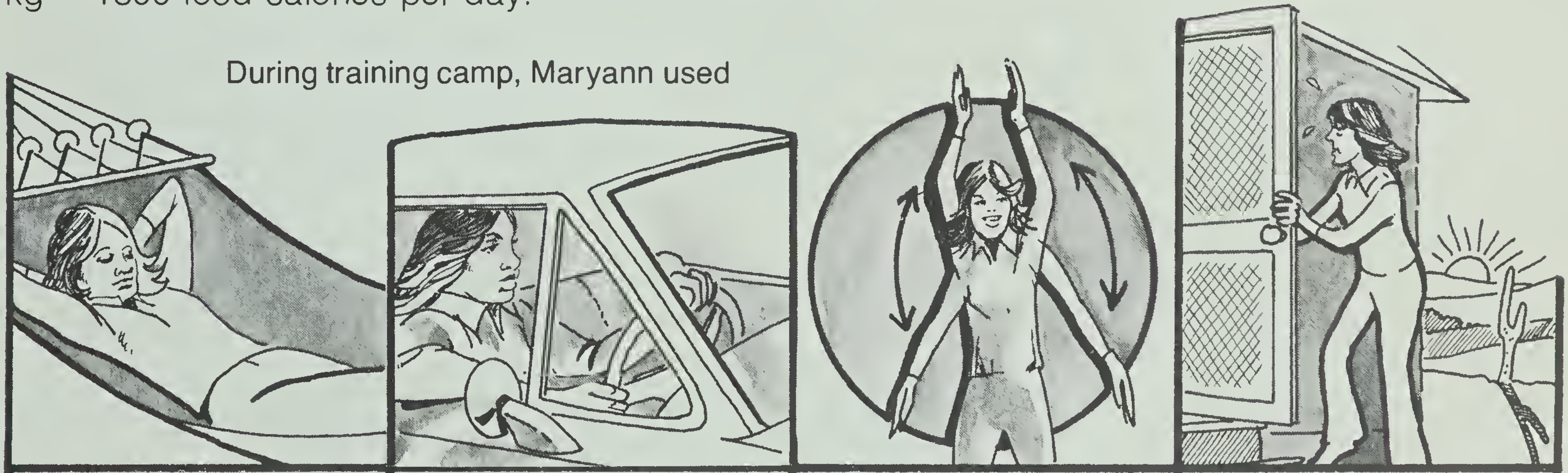
BASAL METABOLIC RATE =
(1 food calorie) × (body weight in kilograms) × (24 hours)

- 7–3. What is basal metabolic rate?

★ 7–4. How is a person's basal metabolic rate estimated?

Maryann's weight was 165 lb (75 kg) before training camp. So, Maryann's basal metabolic rate was 1 food calorie × 24 hours × 75 kg = 1800 food calories per day.

During training camp, Maryann used



about 1800 food calories in basal metabolism.

about 1600 food calories in daily activities.

about 2600 food calories in training exercises.

a total of 6000 food calories each day.

Maryann was taking in about 2500 food calories a day.

- 7–5. How many more food calories was Maryann using than she was taking in?

About 3500 food calories are stored in about one pound, or half a kilogram, of body fat. So, Maryann was using up about one pound, or about a half kilogram, of fat a day. At the end of the first week, her weight had gone from 165 pounds (75 kg) down to 158 pounds (72 kg).

If you're not a professional basketball player, the case of Maryann may not seem normal. But the two things Maryann did to lose weight are the only things that should be done by anyone.

MAGIC FORMULA

A Controlled Diet

Exercise

To stay at any particular weight, you have to balance the calories you take in with the calories you use up. If you take in more calories than you use up, your body will store the extra calories as body fat.

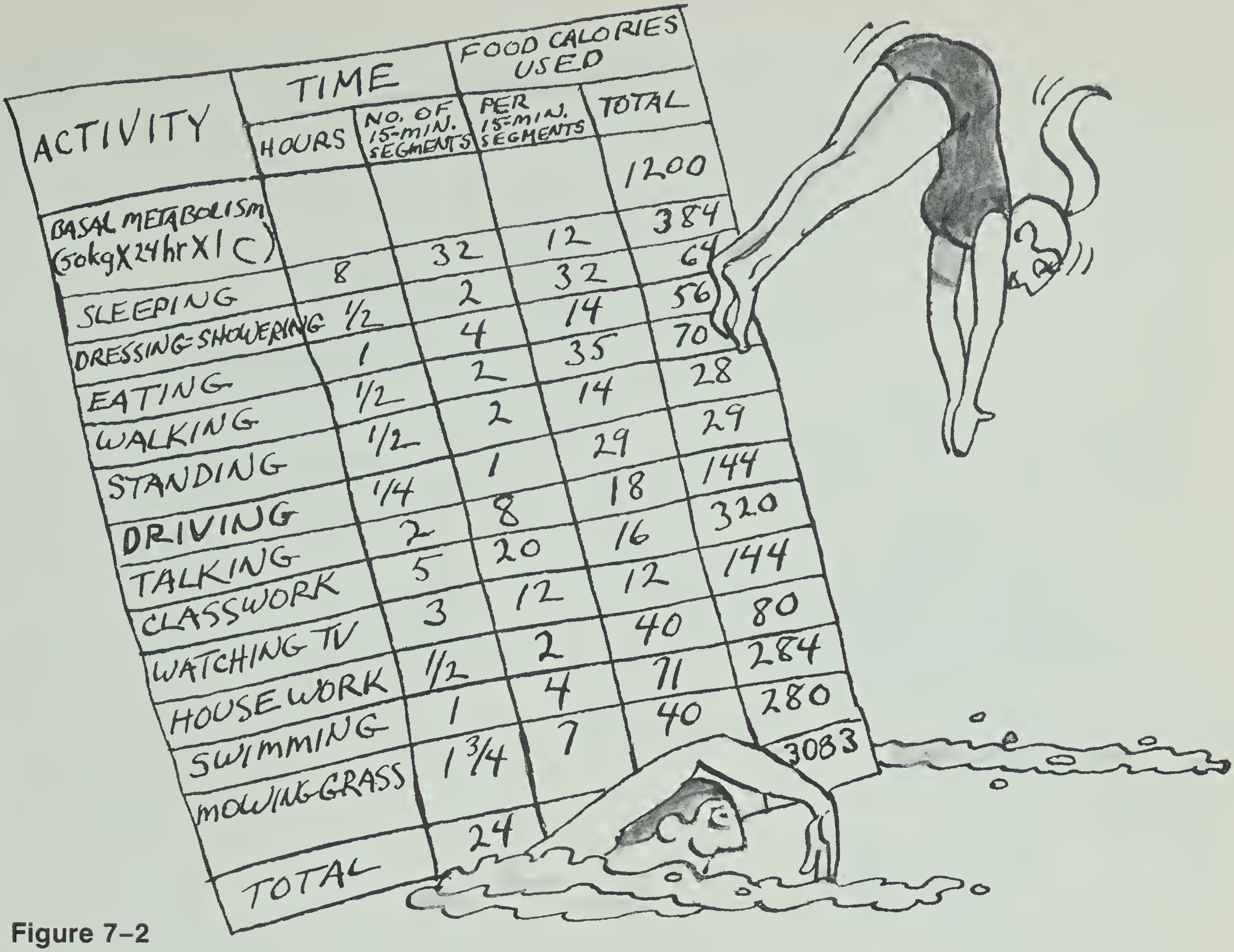
The Activities and Calories Used chart in the *Diet Data* booklet for this minicourse shows the food calories burned by people of different weights while doing various activities.

- 7–6. How many food calories are burned in fifteen minutes of sleeping by a person weighing about 125 pounds (57 kg)?

- 7–7. How many food calories would you burn in fifteen minutes of swimming?

★ **7–8. What is the purpose of exercise in a weight control plan?**

- 7–9. Use the Activities and Calories Used chart to plan a typical daily schedule of activity for yourself. You should include enough physical exercise to use up about 500 food calories. Figure 7–2 is a sample plan.



ACTIVITY	TIME HOURS	NO. OF 15-MIN. SEGMENTS	FOOD CALORIES USED PER 15-MIN. SEGMENTS	TOTAL
BASAL METABOLISM (50kg X 24hr X 1 C)				1200
SLEEPING	8	32	12	384
DRESSING-SHOWERING	1/2	2	32	64
EATING	1	4	14	56
WALKING	1/2	2	35	70
STANDING	1/2	2	14	28
DRIVING	1/4	1	29	29
TALKING	2	8	18	144
CLASSWORK	5	20	16	320
WATCHING TV	3	12	12	144
HOUSEWORK	1/2	2	40	80
SWIMMING	1	4	71	284
MOWING GRASS	1 3/4	7	40	280
TOTAL	24			3083

Figure 7–2

If you eat just 100 extra food calories a day, you will gain ten pounds (four and a half kilograms) in a year. If you eat 100 fewer food calories than you need per day, you'll lose ten pounds (four and half kilograms) a year. So to control your weight, you need to control your calorie intake and exercise.

- 7–10. What is the total number of food calories you use daily in your activity plan?

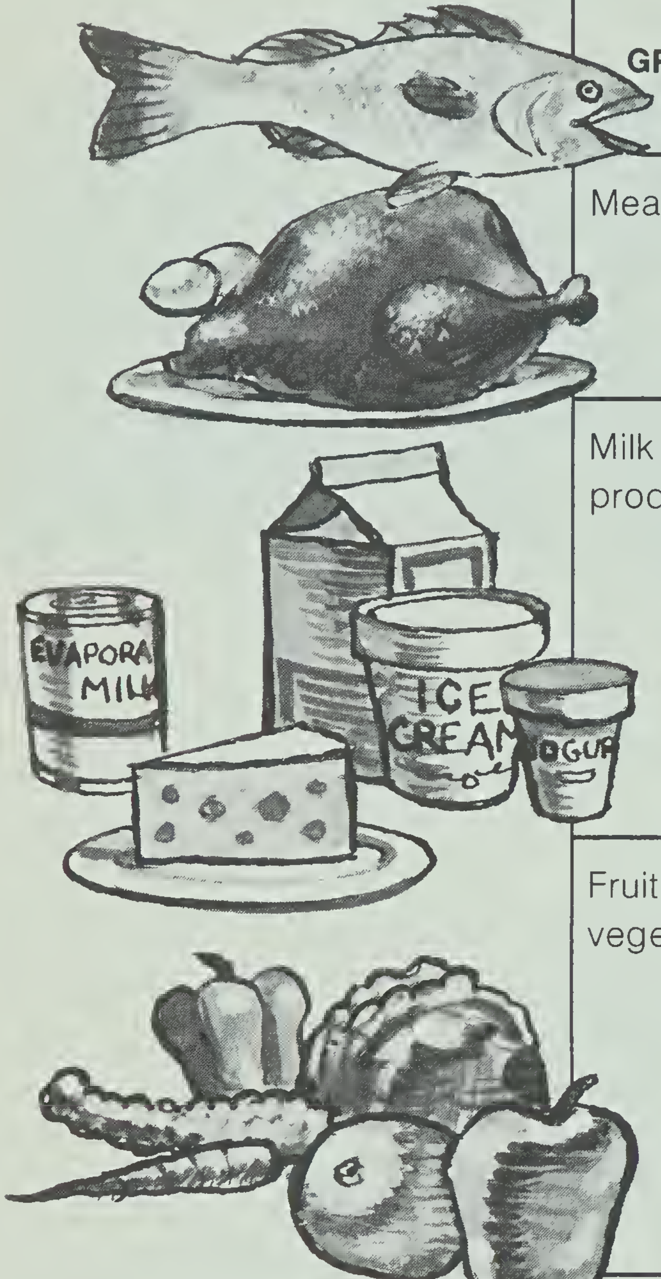
Joe is 15 years old. He is 70 inches (178 centimetres) tall and weighs 158 pounds (72 kilograms). He decides that he needs to lose weight.

- 7–11. How many food calories does Joe need just to stay alive?

Joe decides to take tennis lessons and play for an hour a day. He uses 420 calories each day. In his other activities, like walking, he uses 500 or more calories. So if Joe plans a diet of 2000 calories a day and plays tennis, he'll lose weight.

In planning a diet to maintain, gain, or lose weight, you also need to consider something besides calories. To stay healthy, you must also get enough of the basic nutrients—vitamins, minerals, protein, fat, and carbohydrates.

A good way to plan a balanced diet is to consider the four basic food groups described in Figure 7–3.



BASIC FOOD GROUPS

GROUP	EXAMPLES	RECOMMENDED SERVINGS PER DAY FOR TEENAGERS	NUTRIENTS
Meat	meat, fish, eggs, poultry, peanut butter, dried peas or beans	2 or more	protein; iron; B vitamins
Milk products	whole milk, evaporated milk, skim milk, dry milk, buttermilk, cheeses, ice cream, yogurt	3 to 4 or more	protein; vitamin B_2; vitamin A; calcium; if fortified, vitamin D; and other nutrients
Fruit and vegetables	all vegetables and fruits	1 green or yellow vegetable 1 citrus fruit 2 additional servings of fruits and vegetables	vitamin A in dark green and yellow fruit and vegetables; vitamin C in citrus fruits
Bread and cereal	all breads and cereals that are whole grain, enriched, or restored	4	protein; iron; several vitamins

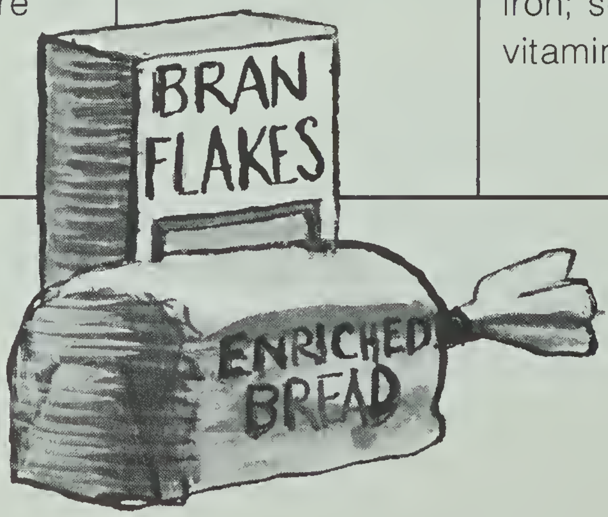


Figure 7–3

See how Maryann's menus before and after one week of training camp fit the recommended number of servings of the basic food groups. Copy the chart in Figure 7–4 in your notebook and then fill in the last two columns.

MARYANN'S RECORD

GROUP	RECOMMENDED SERVINGS	SERVINGS BEFORE	SERVINGS AFTER
Meat	2 +	(?)	(?)
Milk products	3 +	(?)	(?)
Fruit and vegetables	1 citrus fruit 1 green or yellow vegetable 2 additional servings	(?)	
Bread and cereal	4	(?)	(?)

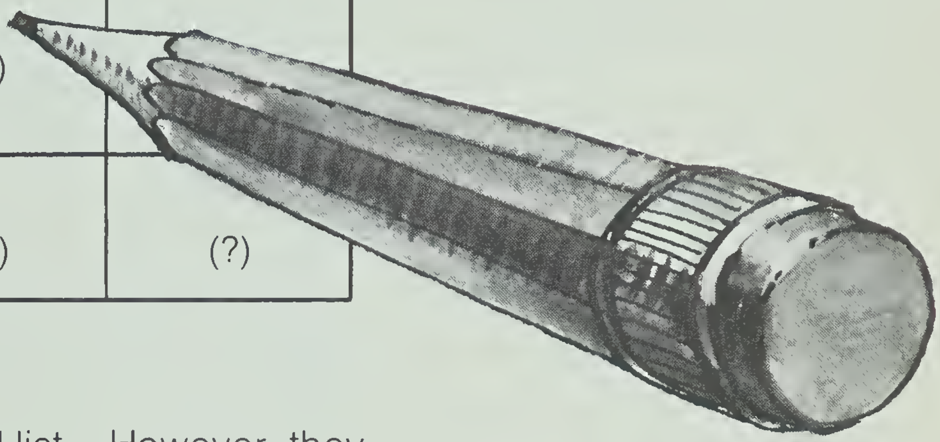
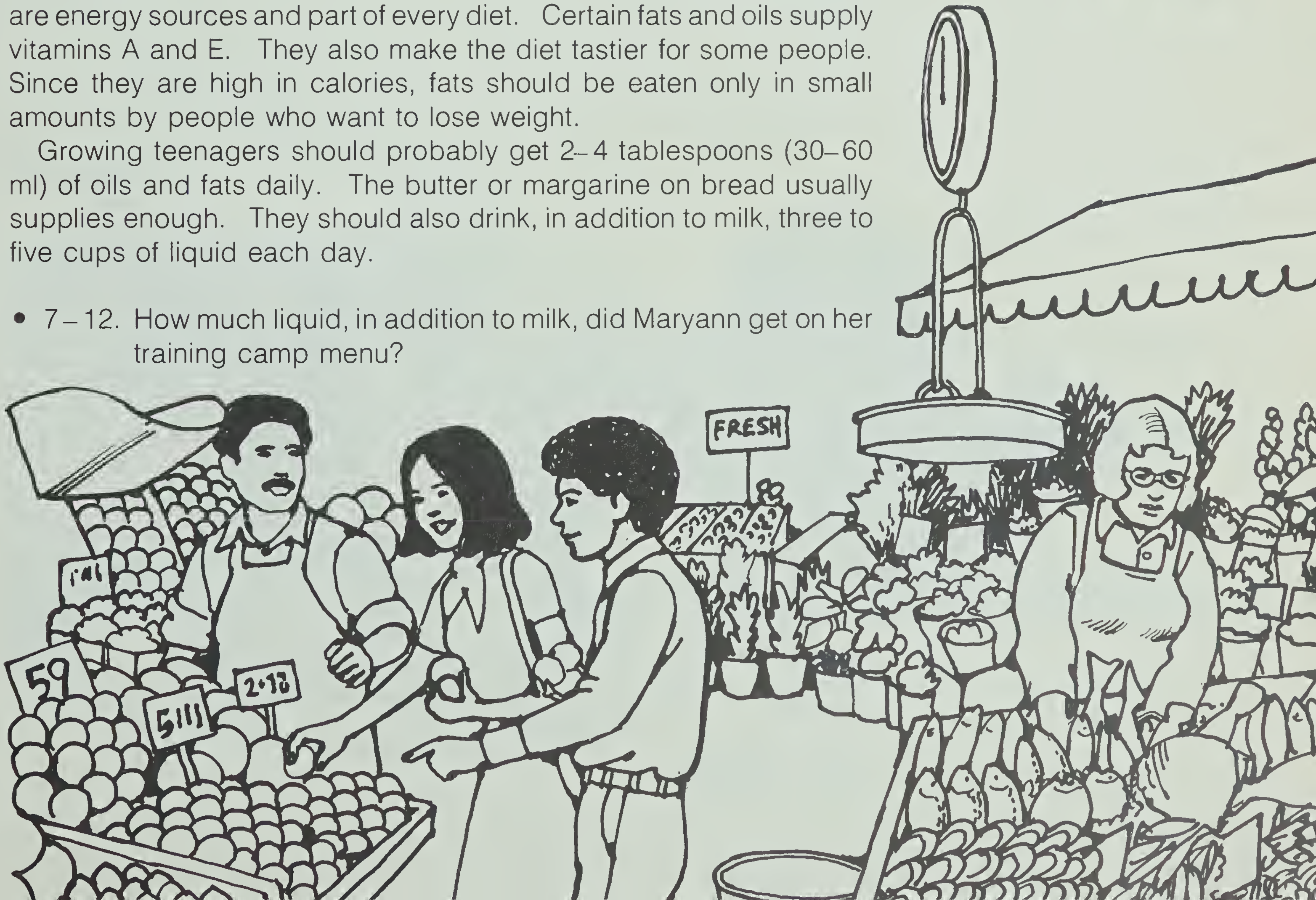


Figure 7–4

Oils and fats are not included in the basic food list. However, they are energy sources and part of every diet. Certain fats and oils supply vitamins A and E. They also make the diet tastier for some people. Since they are high in calories, fats should be eaten only in small amounts by people who want to lose weight.

Growing teenagers should probably get 2–4 tablespoons (30–60 ml) of oils and fats daily. The butter or margarine on bread usually supplies enough. They should also drink, in addition to milk, three to five cups of liquid each day.

- 7–12. How much liquid, in addition to milk, did Maryann get on her training camp menu?



Now you should have a plan for daily activity, and a guide for planning a balanced diet.

You may have to adjust your present intake of food calories up or down to stay at your present weight. One important thing to do before you go on any diet is to check with your doctor.

Activity 8

A, B, C, and Minerals

A balanced diet includes more than the proper amounts of proteins, fats, and carbohydrates. Two other kinds of nutrients are essential for good health. These are vitamins and minerals. Luckily, the foods that provide proteins, fats, and carbohydrates also provide vitamins and minerals.

The Vitamins and Minerals chart in your *Diet Data* booklet lists the vitamins that are considered important for good health, the foods they're found in, what they do, and the deficiency associated with them. The minerals that are most commonly deficient in American diets are also listed.

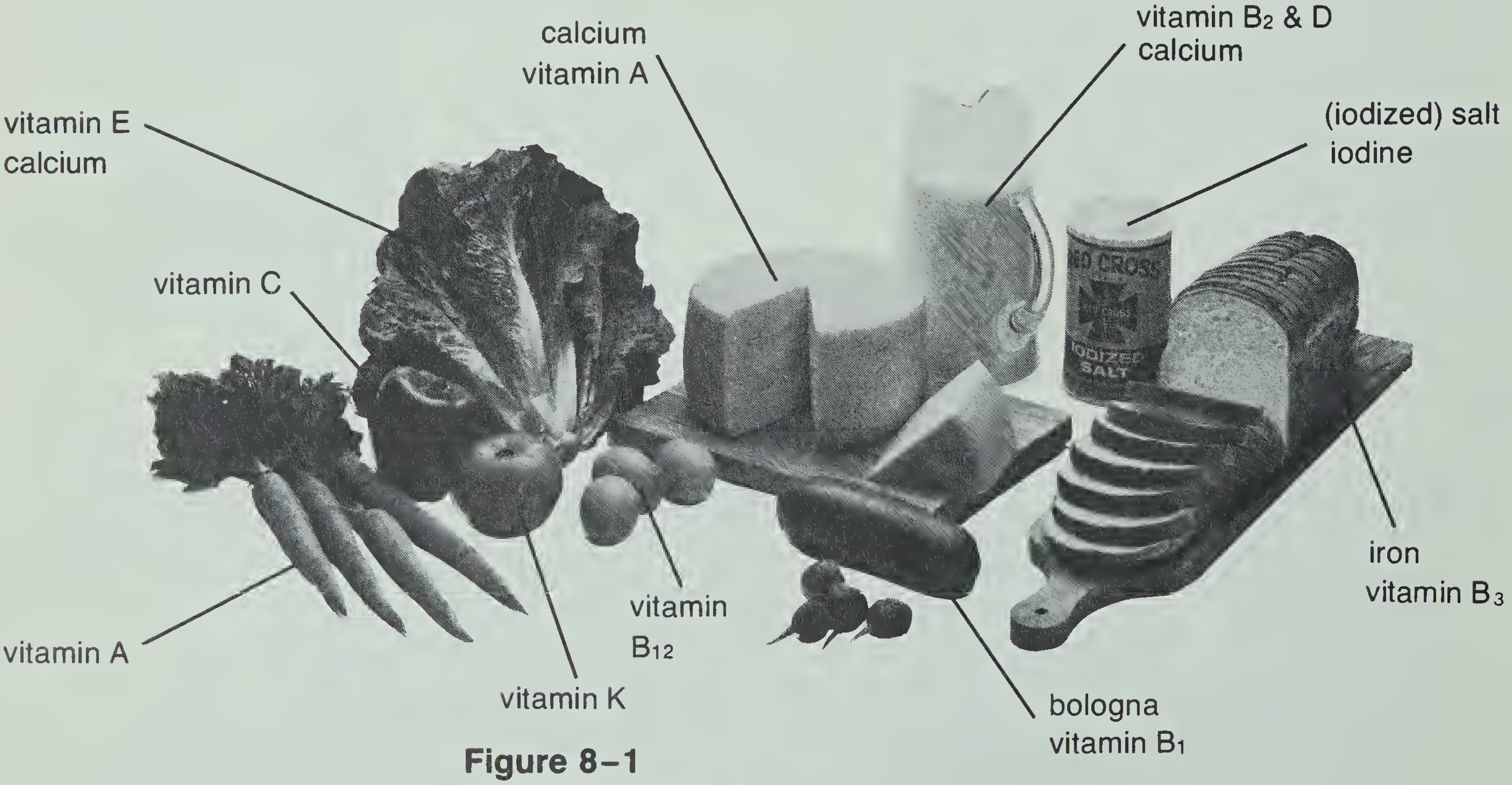


Figure 8–1

Vitamins and Minerals from Foods

Use the Vitamins and Minerals chart in *Diet Data* to answer Questions 8–1 through 8–6.

- 8–1. Which vitamin is related to rickets, a disease of the bones?
- 8–2. Which vitamins help keep the nervous system healthy?
- 8–3. Which vitamins might be given to a person who has anemia?
- 8–4. Many parents tell their children "liver is good for you." In addition to protein, what vitamins does liver contain?
- 8–5. Spinach, turnip greens, and collard greens are dark green, leafy vegetables. For which vitamins are they good sources?
- 8–6. Explain why it is necessary to eat a variety of foods to get enough of all the different vitamins.

Although minerals make up only about 6 pounds (2.7 kilograms) of your body weight, they are as valuable as gold. In fact, they are priceless because you can't live without them. About twenty different minerals are found in your body and are used to carry on essential activities.

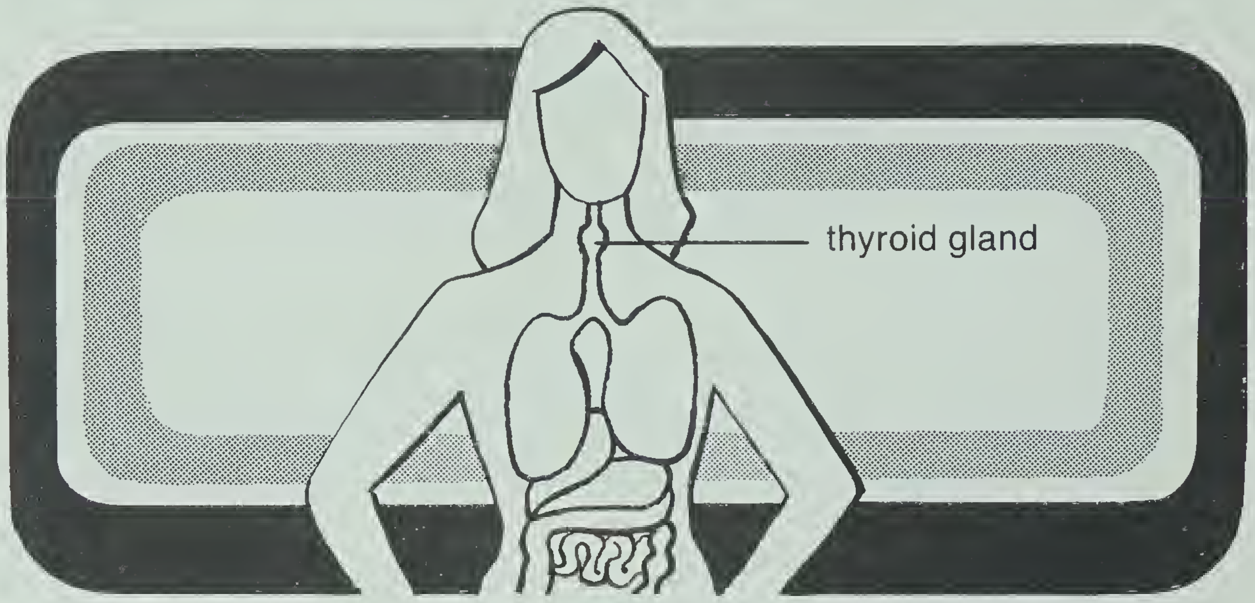
You have more calcium than any other mineral in your body. Except for iron, calcium is the most likely mineral to be lacking in the diet.

Your body has about one-tenth of an ounce, or three grams, of iron. That's about the weight of a penny. It's not much, but all that's needed for red blood cells to carry oxygen to all the cells of your body.

Unfortunately, your body can't store iron. A steady supply from food is needed by red blood cells. Women of child-bearing age need almost twice as much iron as men.

- 8–7. Why do you think iodine is added to table salt (iodized salt)?

The iodine in your body hardly covers the head of a pin. But that tiny bit is very important for the proper functioning of your thyroid gland. Thyroxine, the chemical produced by the thyroid, regulates how your cells change food and oxygen into heat energy. People who eat a lot of seafood rarely lack iodine. But people who live in areas such as the Midwest, where fresh seafood is not plentiful, may have an iodine deficiency.

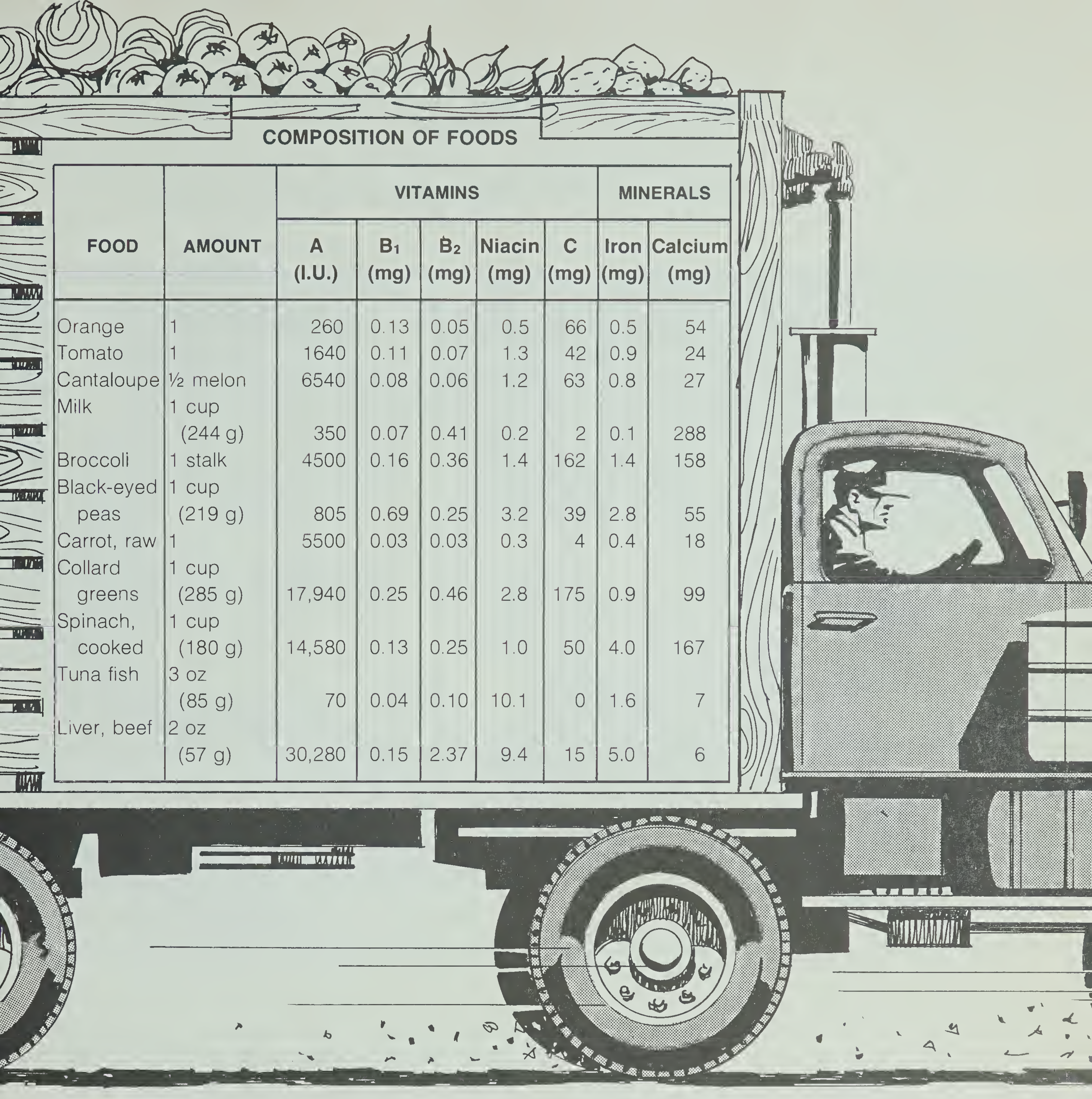


The other minerals your body needs include zinc, copper, potassium, magnesium, sodium, and phosphorus. They are readily available in most foods. You usually get them when you eat foods that supply the major nutrients and vitamins.

★ 8–8. List two good food sources for each of these minerals: calcium, iodine, and iron.

There are certain foods that are often mentioned as being good for you. That's usually because they are good sources of one or more vitamins or minerals. Figure 8–2 lists the nutrients these so-called healthful foods supply.

- 8–9. Using Figure 8–2, name two vitamins or minerals for which each of these foods are good sources.
  - a. liver
  - b. milk
  - c. black-eyed peas
  - d. broccoli
  - e. collard greens
  - f. tomato
  - g. cantaloupe



COMPOSITION OF FOODS

FOOD	AMOUNT	VITAMINS					MINERALS	
		A (I.U.)	B_1 (mg)	B_2 (mg)	Niacin (mg)	C (mg)	Iron (mg)	Calcium (mg)
Orange	1	260	0.13	0.05	0.5	66	0.5	54
Tomato	1	1640	0.11	0.07	1.3	42	0.9	24
Cantaloupe	½ melon	6540	0.08	0.06	1.2	63	0.8	27
Milk	1 cup (244 g)	350	0.07	0.41	0.2	2	0.1	288
Broccoli	1 stalk	4500	0.16	0.36	1.4	162	1.4	158
Black-eyed peas	1 cup (219 g)	805	0.69	0.25	3.2	39	2.8	55
Carrot, raw	1	5500	0.03	0.03	0.3	4	0.4	18
Collard greens	1 cup (285 g)	17,940	0.25	0.46	2.8	175	0.9	99
Spinach, cooked	1 cup (180 g)	14,580	0.13	0.25	1.0	50	4.0	167
Tuna fish	3 oz (85 g)	70	0.04	0.10	10.1	0	1.6	7
Liver, beef	2 oz (57 g)	30,280	0.15	2.37	9.4	15	5.0	6

Figure 8–2

Vitamins and Minerals from Pills

Except for vitamins D and K, your body depends on outside sources for the vitamins and minerals it needs. And, in order to make vitamins D and K, your body needs chemical ingredients from the food you eat.

At times, some people take mineral or vitamin pills under a doctor's supervision. Often pregnant women are given iron tablets, and people on some reducing diets get vitamin and mineral supplements.

But, some people think that if a small amount of vitamins is required by the body, then large amounts are better. So, they take vitamin supplements in the form of capsules or pills without talking to a doctor.

Suppose you know that you don't get as much vitamin A as you need. What should you do? You could find some foods in Figure 8–2 to add to your diet. You could take a vitamin A tablet, which supplies vitamin A, or a multivitamin tablet that supplies vitamins A, B_1, B_2, and B_3. As you can see in Figure 8–2 (page 39), the ''natural'' sources of vitamin A give you a lot of other nutrients at the same time.

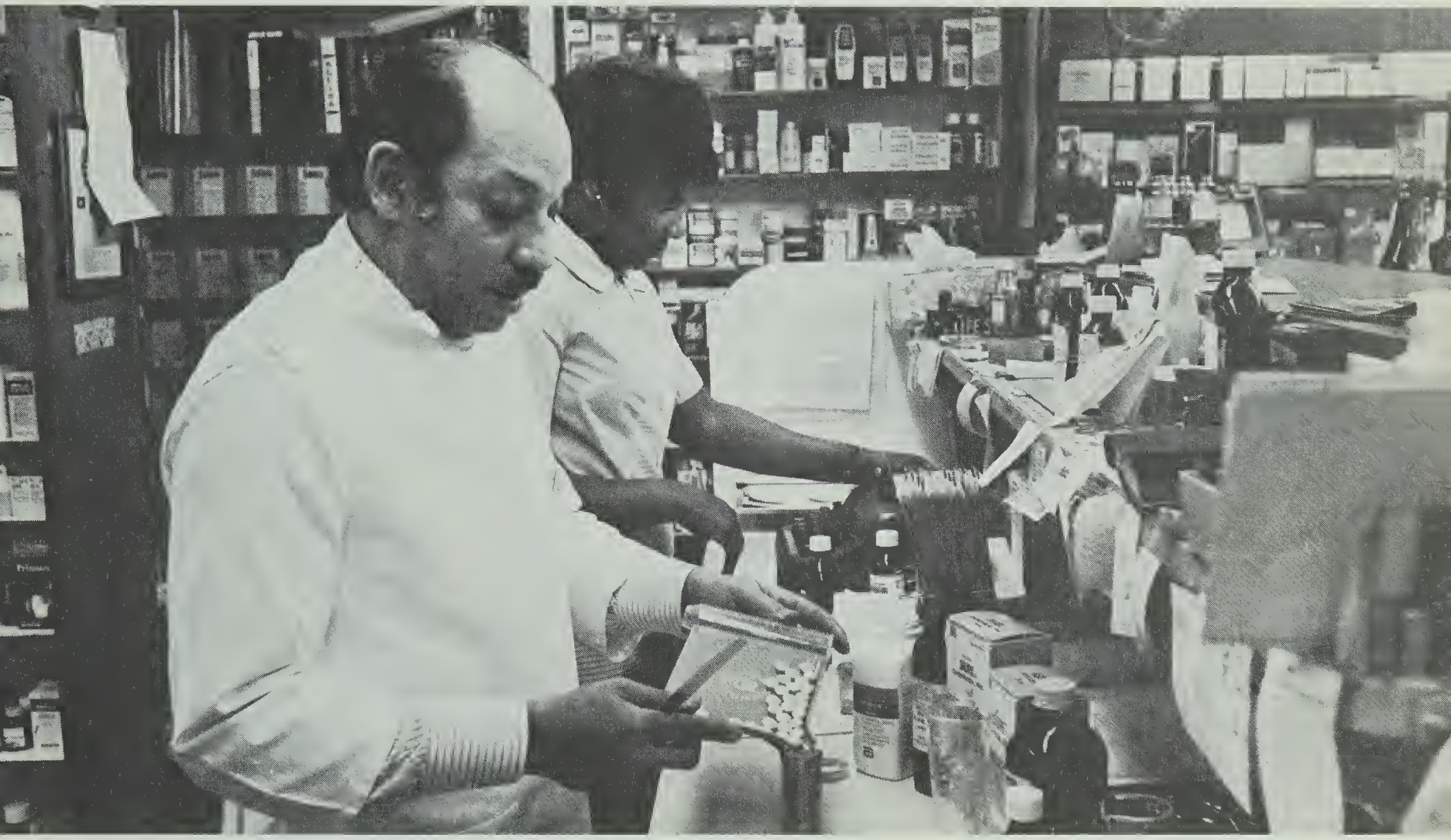
- 8–10. From the Nutrient Values of Foods chart in the *Diet Data* booklet, list at least three foods that you like and that contain more than 1000 I.U. of vitamin A in one serving.

Most vitamins, except for A and D, are not stored in the body. So, if you take in more than your body can use today, they won't keep for tomorrow! You have to take in a new supply each day.

If you get your B vitamins from pills, most of the vitamins will not be used by your body and you'll need a pill every day. If you eat foods high in B vitamins, you'll also get other vitamins, minerals, carbohydrates, protein, fat, and water. Plus good taste and a full feeling!

★ 8–11. What are the disadvantages of getting your U.S. RDA of vitamins and minerals from pills, rather than from foods?

★ 8–12. When might it be advantageous for a person to take vitamins or minerals in pill form?



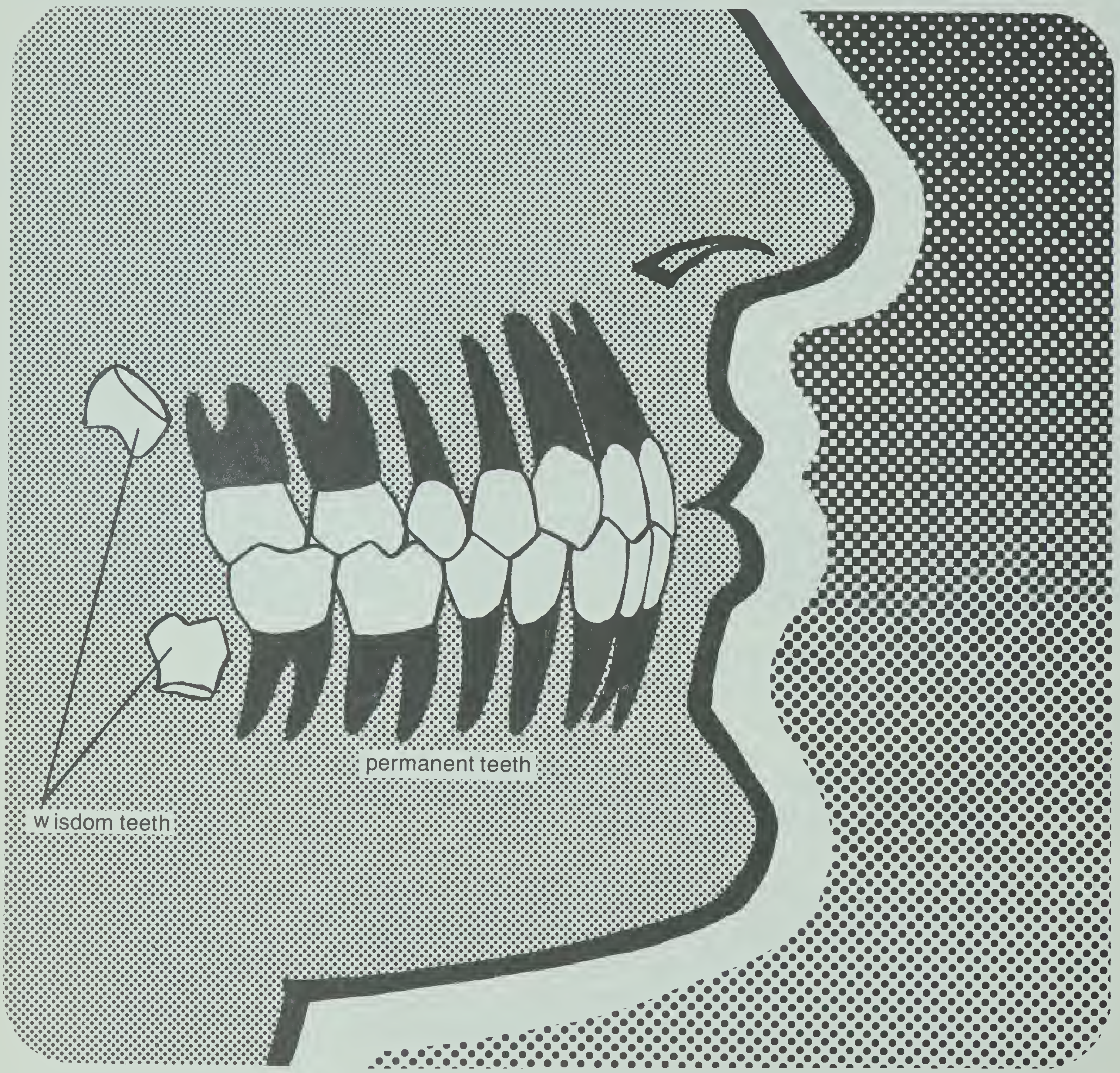
Some vitamins are dangerous when consumed in large quantities for a long period of time. Two of the best known are vitamins A and D. Each can be stored by the body.

★ 8–13. What harm could be done by taking five or six multivitamin-mineral pills daily?

Some people believe that large doses of certain vitamins have medical uses, such as preventing colds, curing certain forms of mental illness, and slowing down the aging process. Many of these claims are being investigated, such as the use of vitamin C to prevent colds. Meanwhile, rely on your doctor to prescribe any supplements to your regular diet. For most of us, a balanced diet provides all the vitamins and minerals we need and can use.

Activity 9
Sweet Teeth Hazards

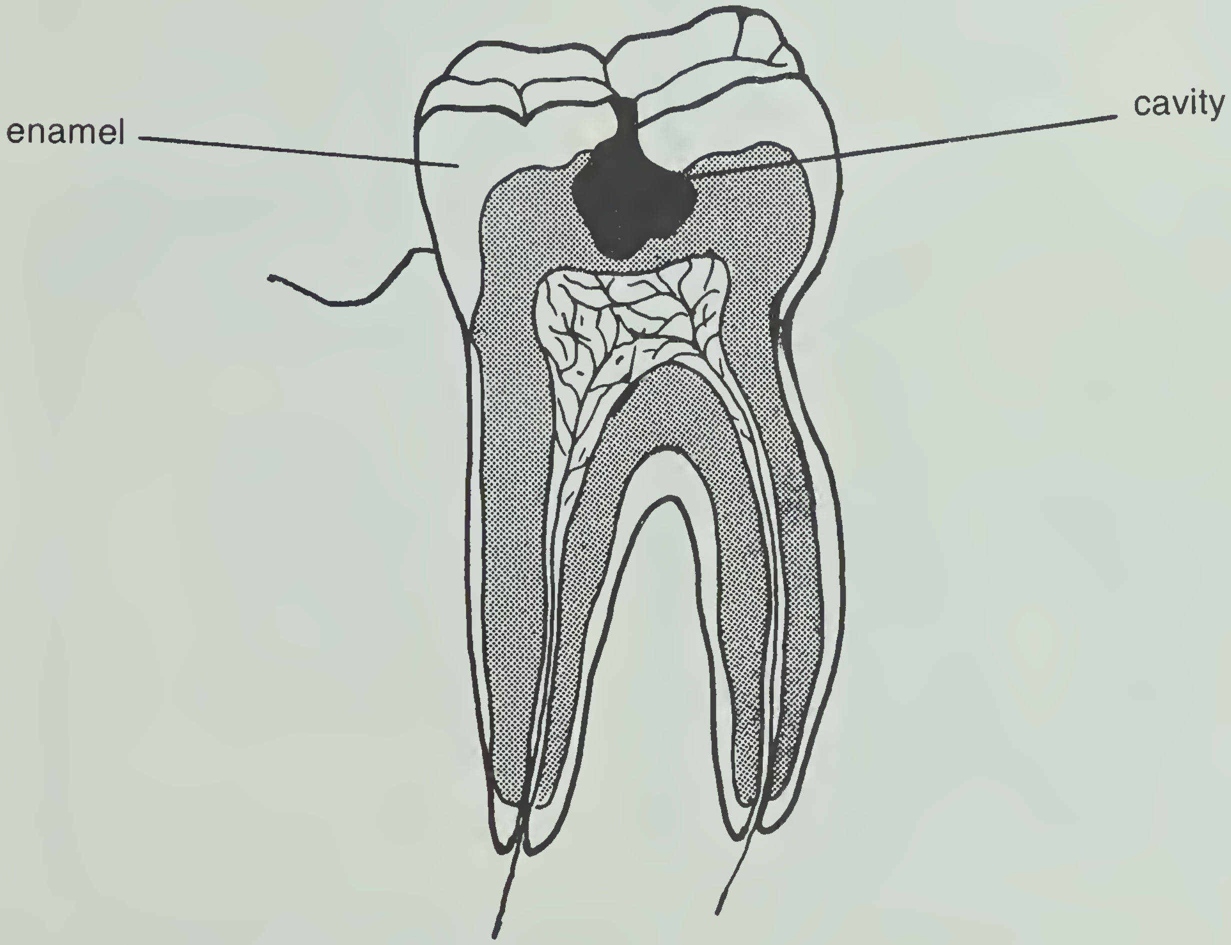
All people have bacteria in their mouths. As the bacteria act on sugars and starches they make acids and sticky substances.



- 9–1. Which foods left in the mouth are most likely to be used by bacteria?
  a. sugars
  b. starches
  c. fats
  d. proteins

- 9–2. In the mouth, which foods are bacteria most likely to feed on, producing acids and sticky substances?
  a. candy bar
  b. peanuts
  c. ice cream
  d. cheese
  e. chewing gum
  f. celery

Plaque [PLAK] is a combination of the acids, bacteria, gumlike substances, and juices in your mouth. Some people call it living glue. The acids are the most harmful. They dissolve *enamel* on teeth. Enamel is the white, outer covering of a tooth. It is the hardest material in the human body. As enamel is removed, *cavities* form.



- 9–3. What in plaque contributes most to producing cavities?

- 9–4. What produces the acids in plaque?

Plaque can also irritate the tissues of the gums, making the gums red and tender. Plaque also causes bad breath.

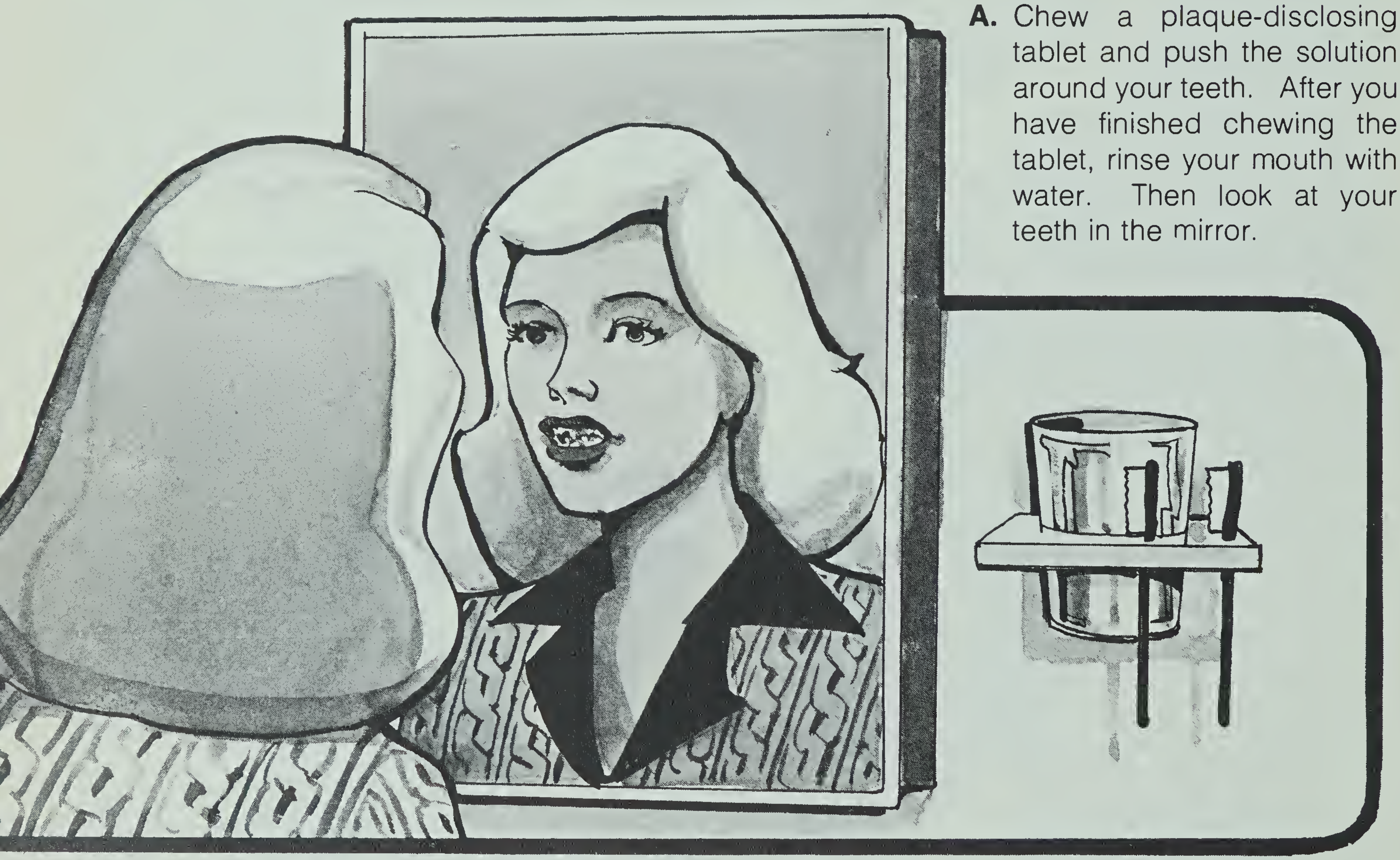
- 9 – 5. Besides cavities, what are two other bad effects of plaque left on the teeth?

Brushing your teeth well at least twice a day is a must. Brushing and flossing your teeth are the best ways to remove plaque. If you haven't been shown how to use dental floss properly, ask your dentist to show you. It's important to floss every day. Even rinsing your mouth out with water between brushings helps remove plaque. Some foods, such as apples, help clean plaque from teeth when chewed well.

To examine your teeth for plaque, you will need the following:

plaque-disclosing tablet
mirror
your toothbrush (or disposable toothbrush)

A. Chew a plaque-disclosing tablet and push the solution around your teeth. After you have finished chewing the tablet, rinse your mouth with water. Then look at your teeth in the mirror.



- 9 – 6. How many teeth do you have?

- 9 – 7. How many of your teeth show the red stain?

An "oral hygiene score" tells people how clean their teeth are. To find your oral hygiene score multiply the number of red-stained teeth by 100 and divide by the total number of teeth. For instance:

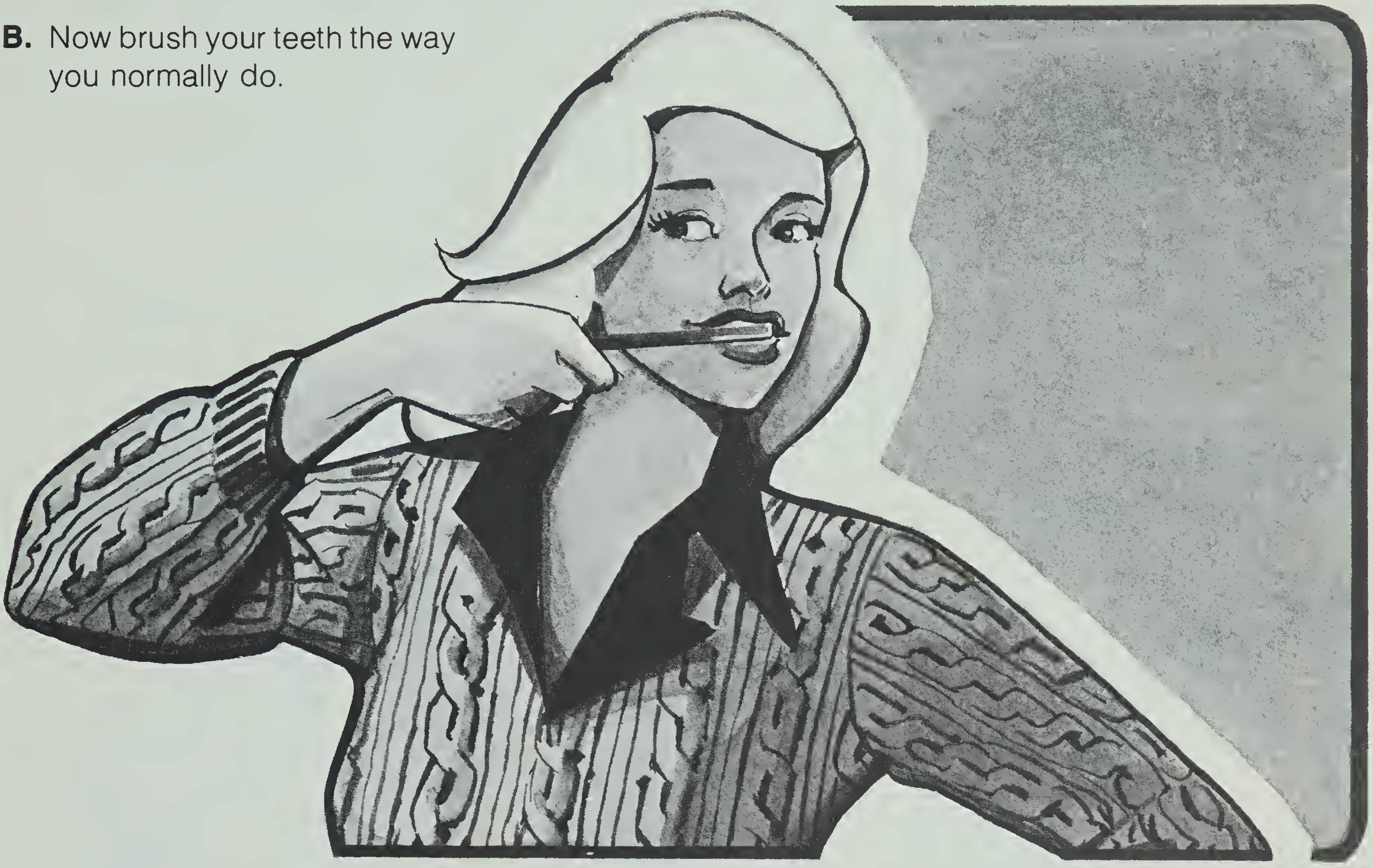
2 stained teeth × 100 ÷ 32 teeth = 200/32 = 6.25

20 stained teeth × 100 ÷ 30 teeth = 2000/30 = 66.67

- 9–8. What is your oral hygiene score?

A perfect score is zero. A high score means you are not taking proper care of your teeth.

B. Now brush your teeth the way you normally do.

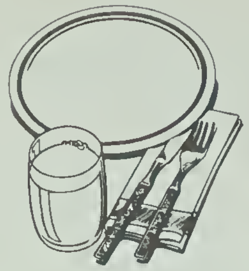


- 9–9. Compare the amount of plaque (shown by red stains) before and after brushing your teeth.

If you don't remove plaque from your teeth, it will harden and become tartar. And brushing doesn't remove tartar.

You can cut down on plaque by cutting down on the sweets you eat. An apple is not only better for you than a piece of chocolate fudge, it also helps clean your teeth.

★ 9–10. What are two ways to reduce tooth decay?



Activity 10

Haves and Have Nots

The amount of food produced and eaten varies a great deal from country to country. Not all countries produce enough food to feed all their people well. Based partly on the amount of food produced and eaten, the countries of the world can be roughly divided into two groups, developed and developing. Those countries in which food, clothing, and other things are readily available to many people are called *developed,* while the other countries are called *developing*.

Figure 10–1 compares protein and calorie intake of people in different parts of the world. Also, the average daily intake of animal protein in grams per person is shown with the names of some countries.

DISTRIBUTION OF PROTEIN AND CALORIES IN THE WORLD

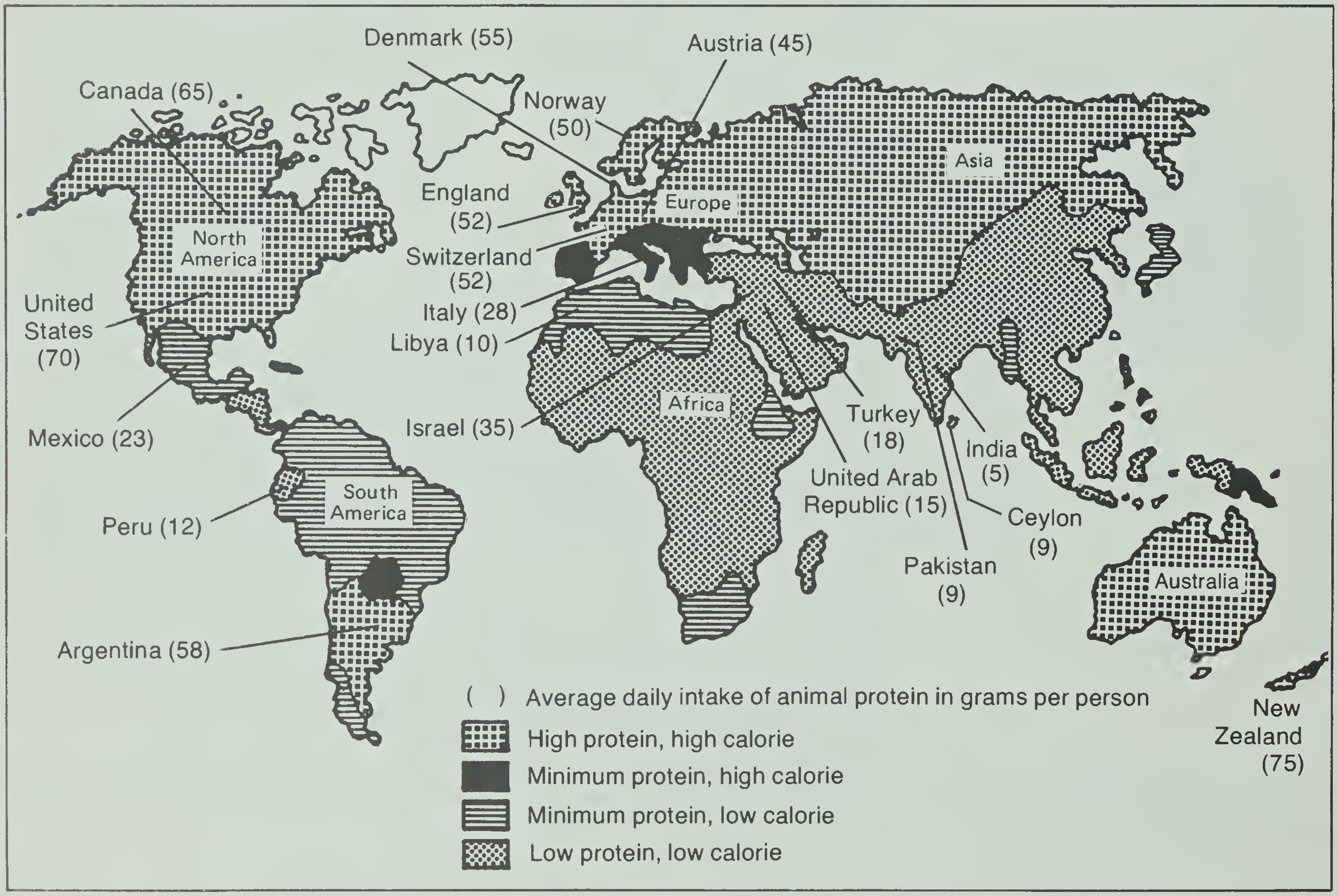
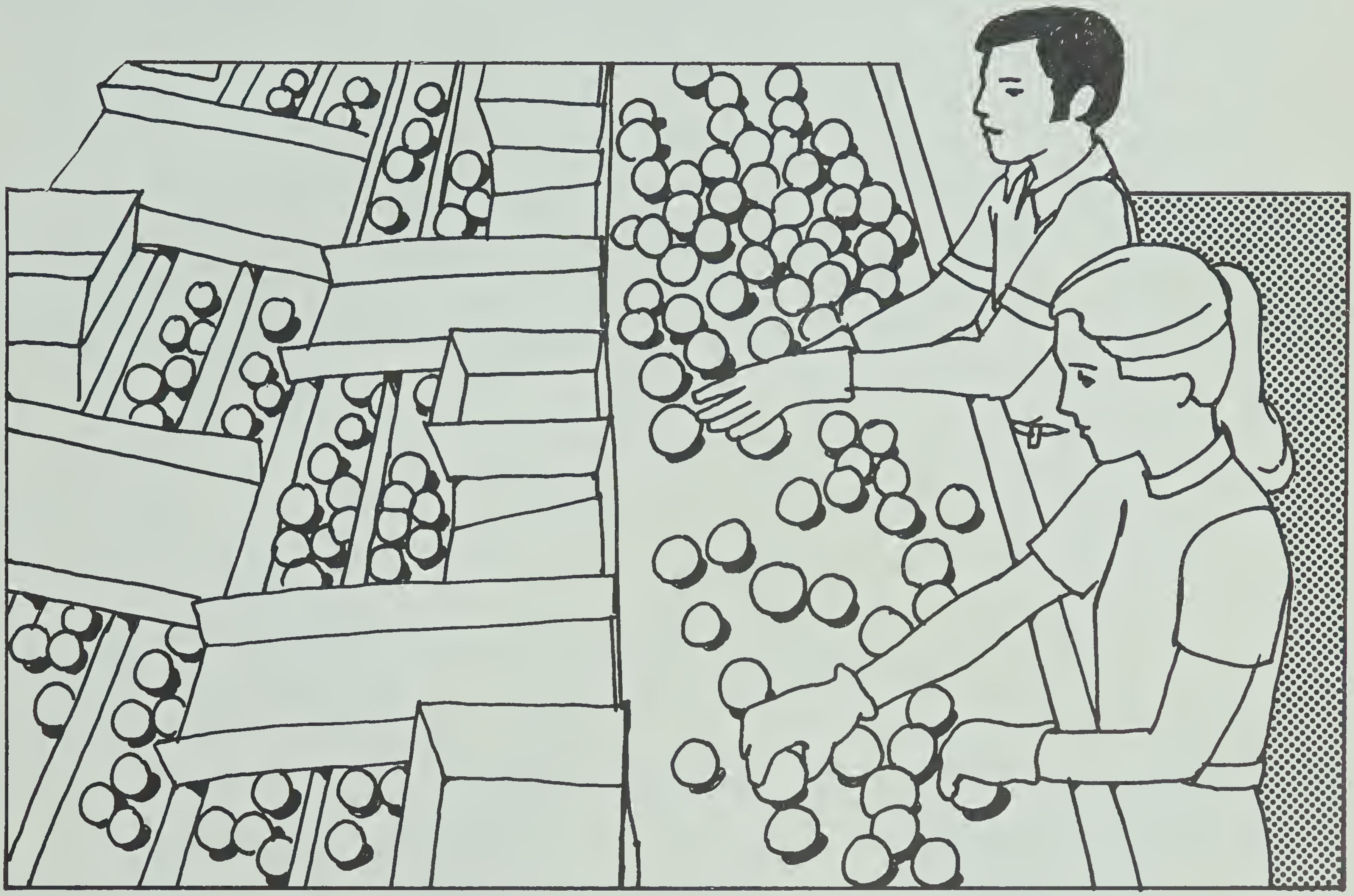


Figure 10–1

- 10–1. Most people over four years old need about 50 to 65 grams of protein a day.
  - a. List four countries in which most citizens get at least or more than their required protein.
  - b. List eight countries in which most citizens may not get their daily protein needs.

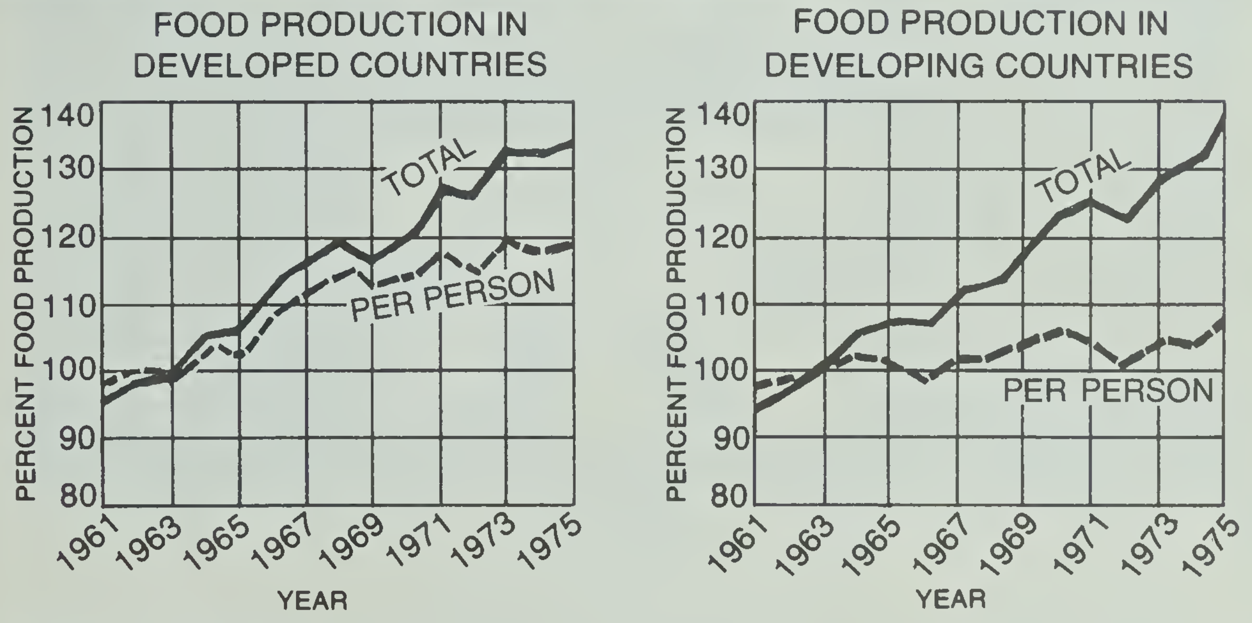
★ **10–2. What amount of protein and calorie intake is typical of people living in southern Asia and Africa? In North America and Europe?**

In developed countries, the amount of food available is enough for all to have healthy diets. Only a small number of people with very low incomes has difficulty getting a healthy diet.



In the last twenty years, there has been a steady increase in world production of food. Improvements in agriculture helped increase food production, but food production hasn't kept up with the increases in population. Most of the big increases in population are occurring in Asian, Latin American, and African countries. These countries are struggling to feed their people.

Figure 10–2 shows how the production of food has changed over the last fifteen years. The solid lines show total food production while the broken lines show food production per person. If you have trouble understanding the graphs, read *Resource Unit 2*.



FOOD PRODUCTION IN DEVELOPED COUNTRIES

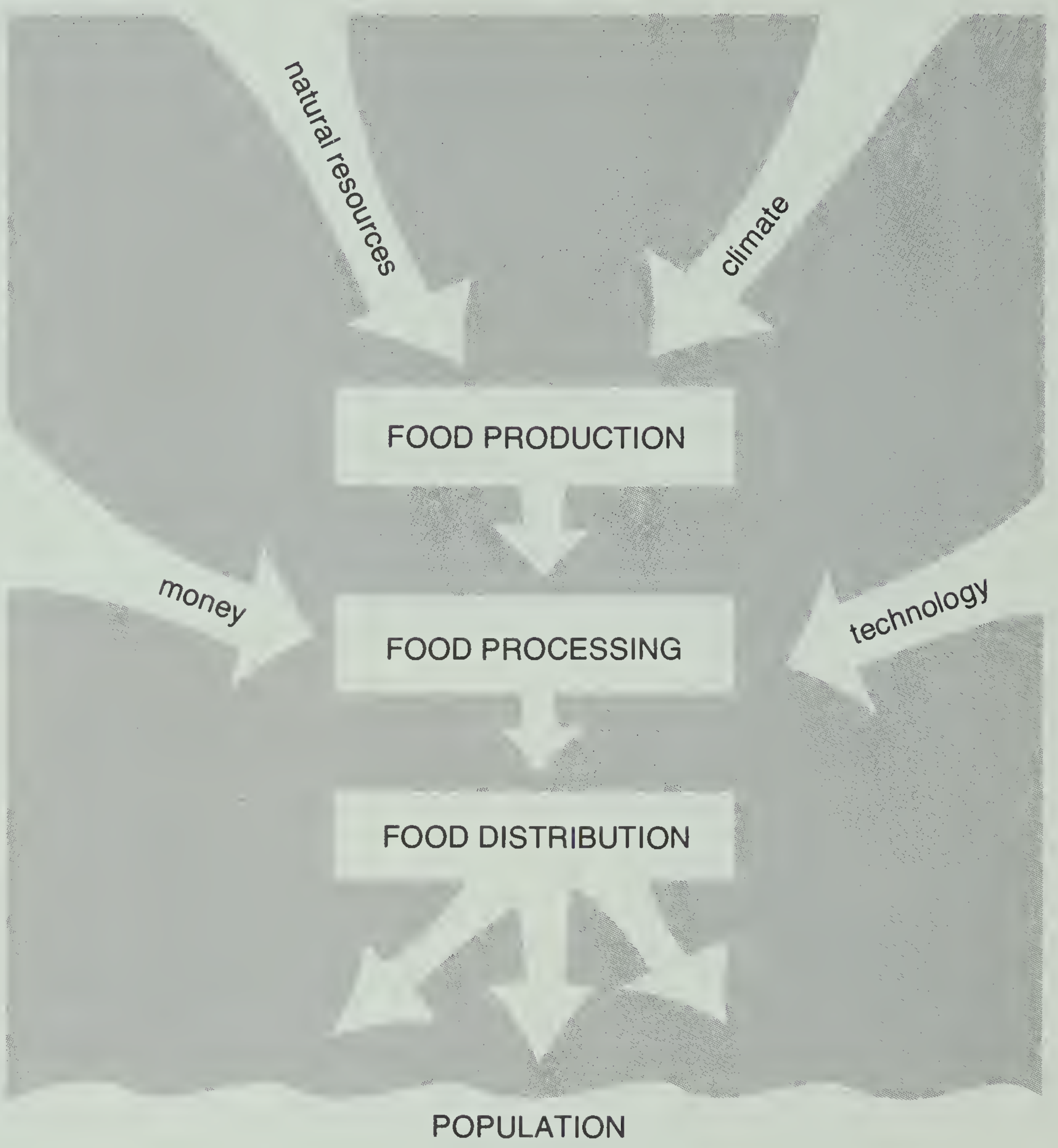
FOOD PRODUCTION IN DEVELOPING COUNTRIES

Figure 10–2

- 10–3. What has happened to total food production in both developed and developing countries in the past fifteen years?

★ **10–4. In the last fifteen years, what has happened to the food production per person in developed and developing countries?**

Any drastic change in weather or any other natural disaster can quickly affect the food production per person. For example, in developing countries the food production per person was decreasing in 1965. The reason for this was severe droughts in India and other countries. More food is produced in India than any other developing country. So changes in Indian output have a big effect on the total amount for all developing countries.

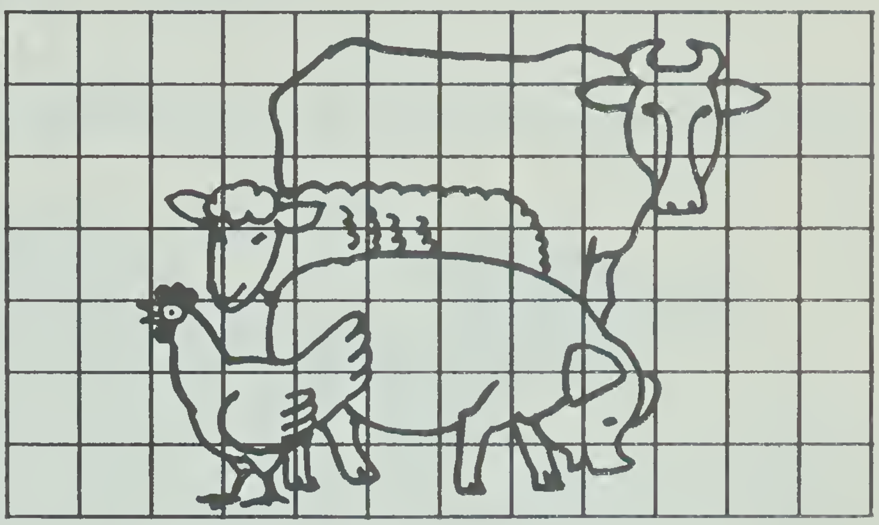


Food distribution also plays an important part. There may be plenty of food in one place, but it may not be where most people are. Transportation and distribution of food cost money. The final result is that people with money can eat well and people without money can't.

The poor people of the world usually eat starchy foods, such as potatoes, rice, and wheat. Starchy foods are relatively cheap. It takes much less land and labor to produce starchy foods than it does to produce other foods.

As countries have become richer, more meat is being eaten, particularly beef. The United States has only seven percent of the world's population, but the people eat thirty percent of the world's supply of animal food. This much animal food in the diet may not be healthy.

Only 7% of the world's population is in the United States.

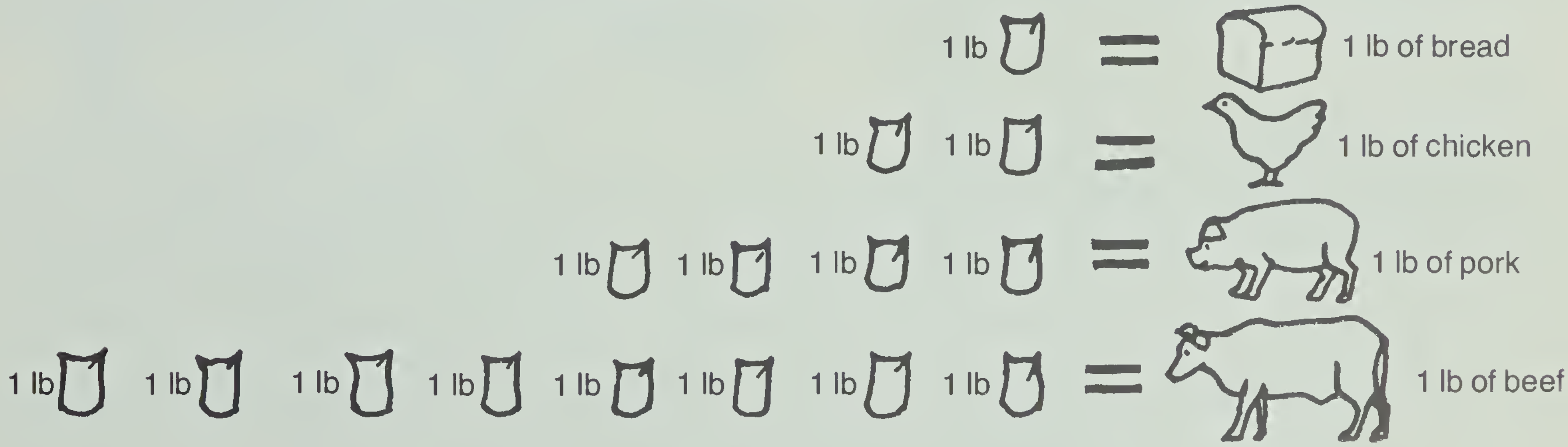


But 30% of the world's supply of food from animals is eaten there.

★ 10–5. In developing countries, wheat, rice, and potatoes are eaten more than other foods. How might the diets of the people change as the countries develop?

The increasing emphasis on animal food is one reason for high food prices. About ninety percent of all the grain grown in the United States is fed to animals. And, usually, high quality grain ends up in the feed bag, especially when cattle are fattened in a feed lot.

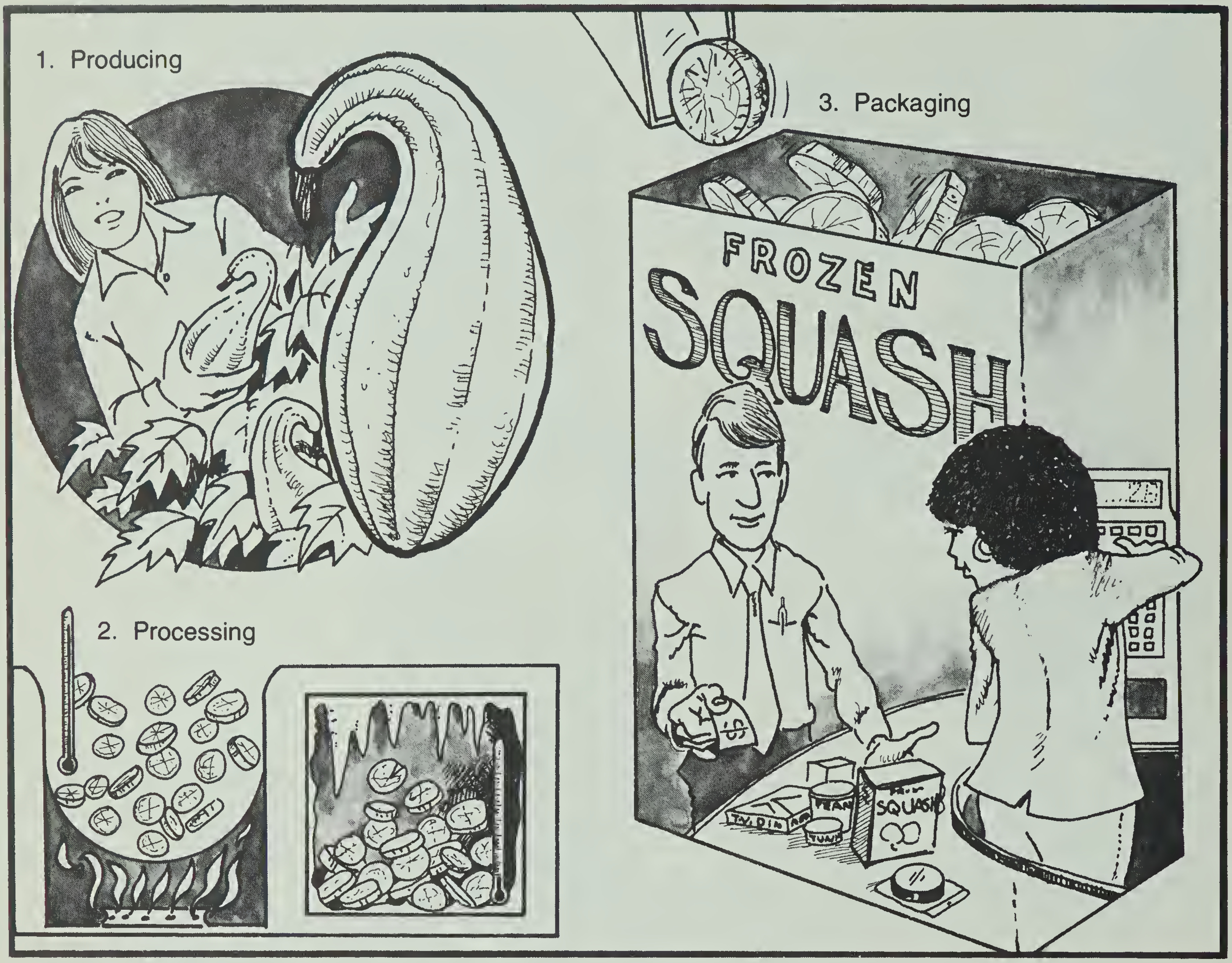
FROM GRAIN TO MEAT


1 lb = 1 lb of bread
1 lb 1 lb = 1 lb of chicken
1 lb 1 lb 1 lb 1 lb = 1 lb of pork
1 lb 1 lb 1 lb 1 lb 1 lb 1 lb 1 lb 1 lb = 1 lb of beef

- 10–6. About 1800 pounds (816 kilograms) of grain per person is used every year in the United States. Of this, only 100 pounds (45 kilograms) are eaten in foods such as cereals and bread. What happens to the rest of the grain?

Activity 11

Technology and Food



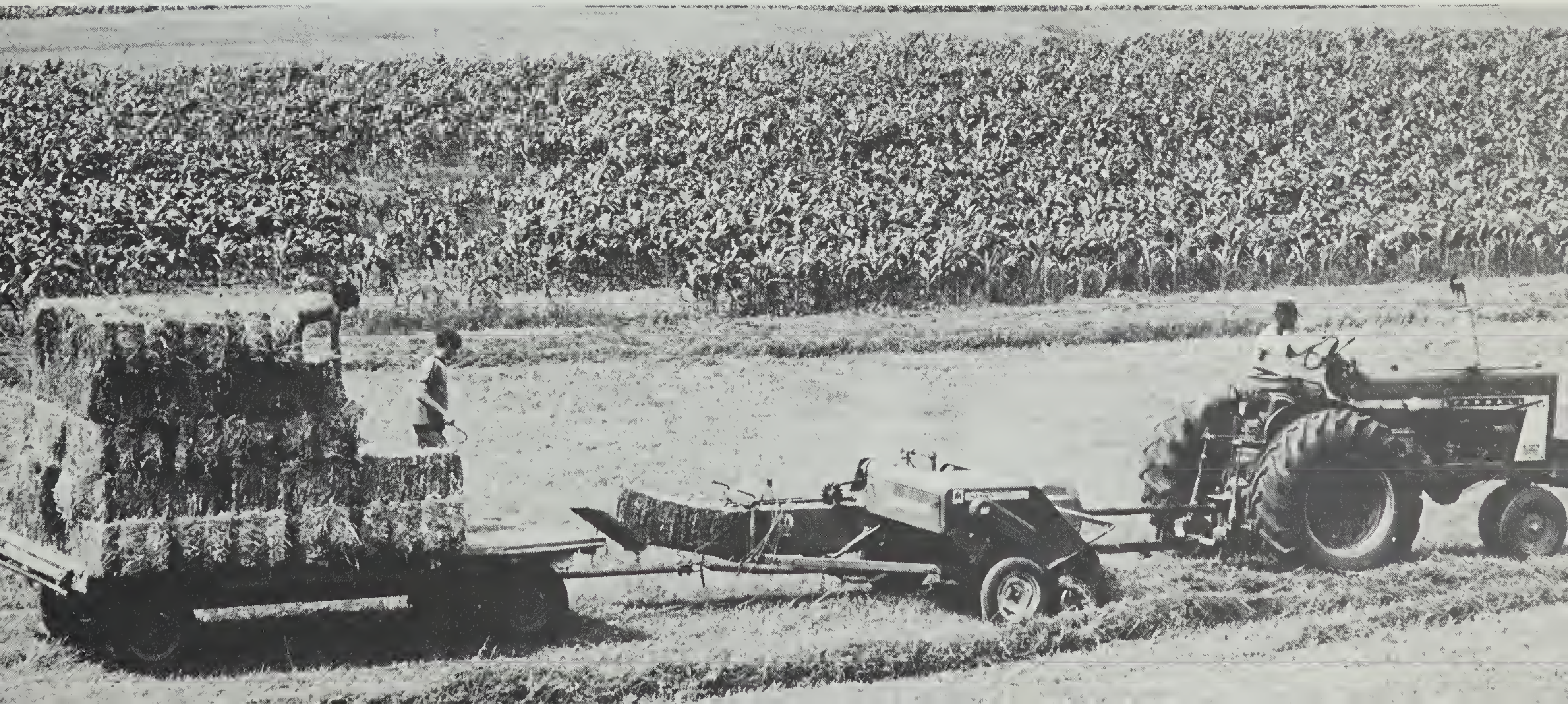
Most people in the United States eat well and a lot. In a year, an average family of four eats 1000 pounds (454 kilograms) of fruits and vegetables, 1500 pounds (680 kilograms) of dairy products, 1000 pounds (454 kilograms) of meat and fish, and 1000 pounds (454 kilograms) of grain products.

The food is high in quality and easy to prepare. Quick-freezing and canning provide fruits and vegetables in all seasons. All of this is the result of better technology in producing, processing, and packaging of food.

Take a closer look at what has happened to technology in one area—agricultural products. In the United States, great changes have been made in agricultural production in the past 60 to 70 years.

In 1900 one farmer produced enough food to feed **7** people.

In 1970 one farmer produced enough food to feed **50** people.



- 11–1. Since 1900, what has happened to the productivity of the farmer in the United States?

Here's how this tremendous change in productivity came about.

MACHINERY

Once people and animals supplied all the labor for planting, cultivating, and harvesting food.

Then gasoline engines were invented and farmers used them for farm work and getting the food to market.

Improvement in farm machinery has reduced the numbers of farm workers.

FERTILIZER

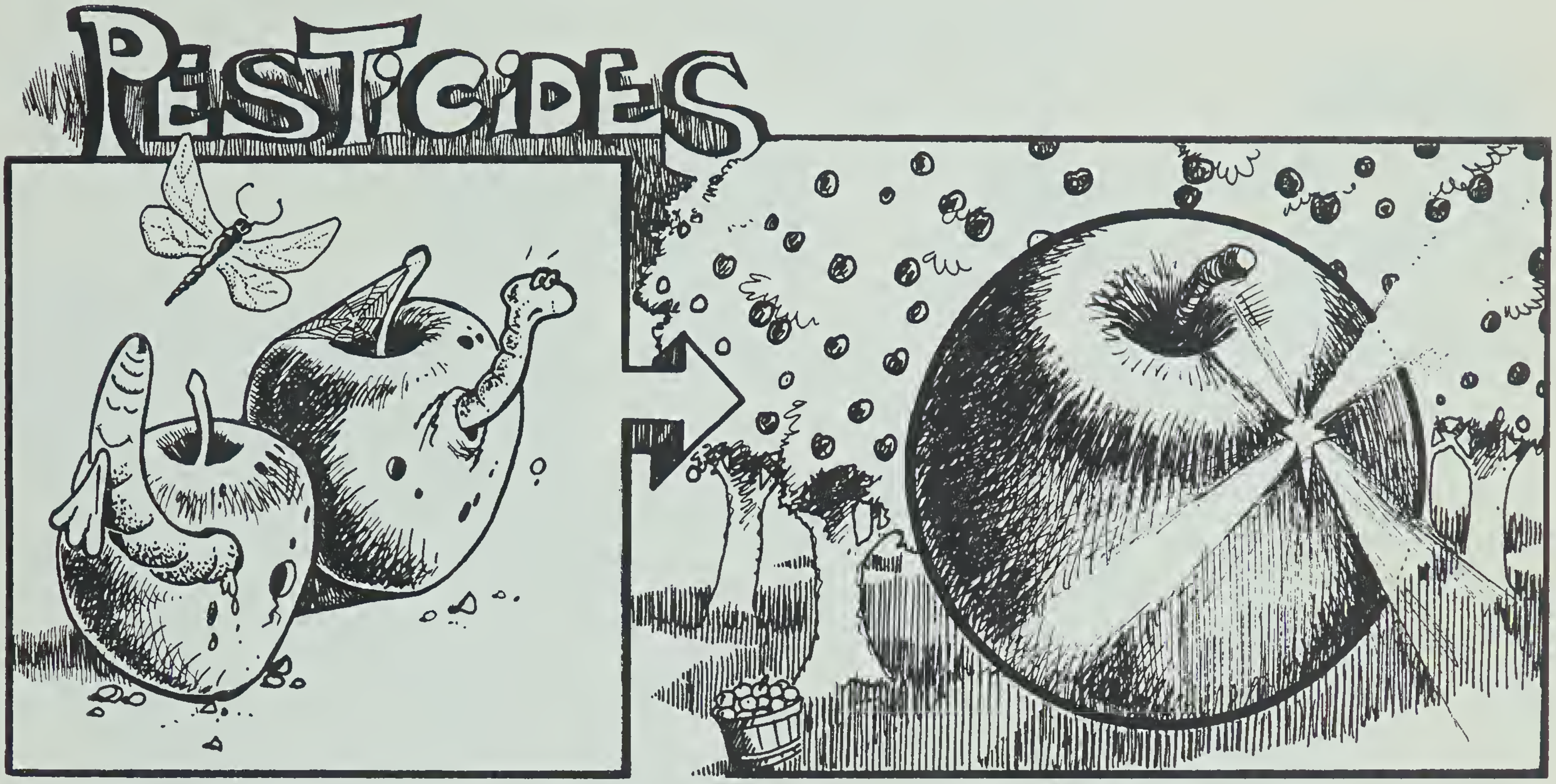
Good soil isn't found everywhere and its nutrients are used up in a few years.

Development of chemical fertilizers to add nutrients to soil increased the yields of crops.

Have you heard the old saying, "You can't get something for nothing"? Well, increased productivity didn't come without a price. It turns out technology has some bad effects.

Fertilizers not used by plants sometimes contribute to pollution in streams and groundwater. Exactly how harmful fertilizers are to the environment is still a big question. Many fertilizers contain substances that can react with foods to produce cancer, stillbirths, and deformities.

- 11–2. List one benefit and one danger of using fertilizer on farm crops.



Every crop has its own pests—bugs, insects, fungi, and bacteria—that destroy or damage the crop.

Chemical pesticides have been developed to kill pests before they can damage a crop.

Pesticides are also important to agriculture. In general, they are effective, safe, and cheap. Sometimes, however, the good that pesticides do is offset by the harm they cause. Besides being harmful to pests, some are also poisonous to people and animals.

★ 11–3. Describe a possible harmful effect of using pesticides.

"Organic" gardeners avoid the problems of chemical pesticides and fertilizers. Instead of manufactured chemicals, they use dead plants and animal material, such as manure, ashes, bones, and garbage, for fertilizer. They may also use insects that are harmless to humans to destroy the insects that could destroy their plants.

★ 11–4. What three areas of technology help farmers increase crop yields?

Activity 12

How To Stop Overeating

Continuous overeating is a road to being overweight. An overeater is anyone who takes in more food energy than his or her body can use. But people are different, so what's overeating for you may be just right for someone else.

- 12 – 1. What happens when you take in more food than your body uses?

Many eating habits are started early in a person's life. Overeating is a habit that can be difficult to change. The foods people eat and the amount they eat are influenced by many things.

- 12 – 2. Have you ever tried to break a habit? If so, what kinds of things did you do?

Experiments show that people who are overweight often behave differently from people of normal weight when exposed to food or when thinking of food. People of normal weight usually want to eat when their stomachs are empty. People who are overweight can want food whether their stomachs are empty or full. Some of the things that make many overweight people want food are shown in Figure 12–1.

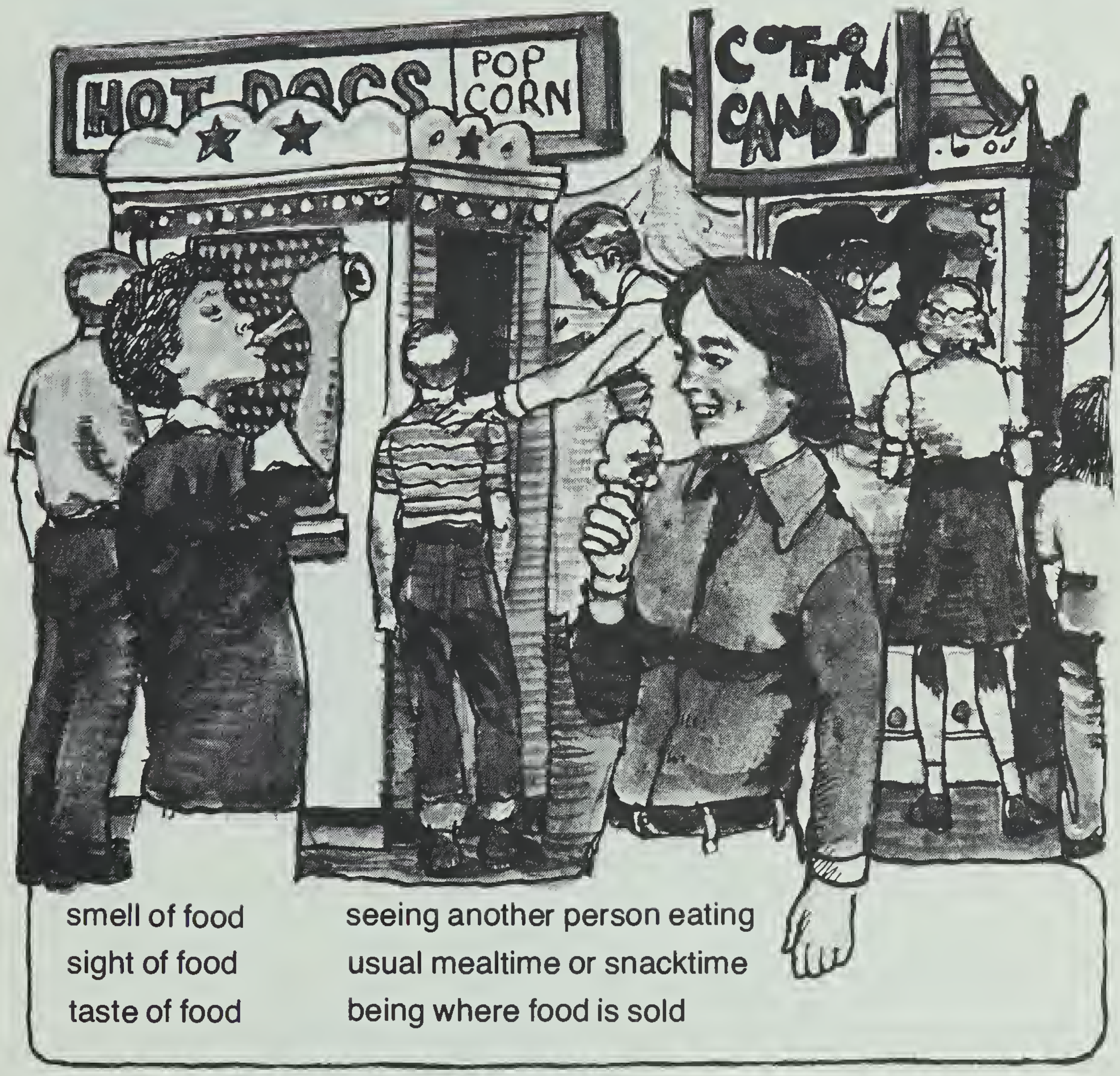
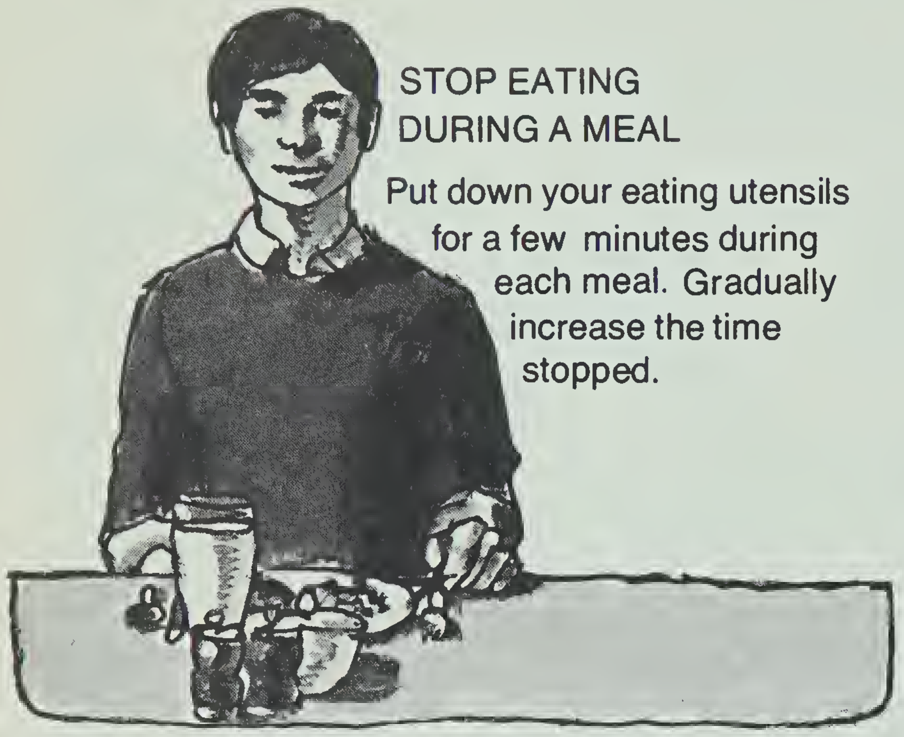


Figure 12–1

★ **12–3. Describe at least four things that may stimulate overeating.**

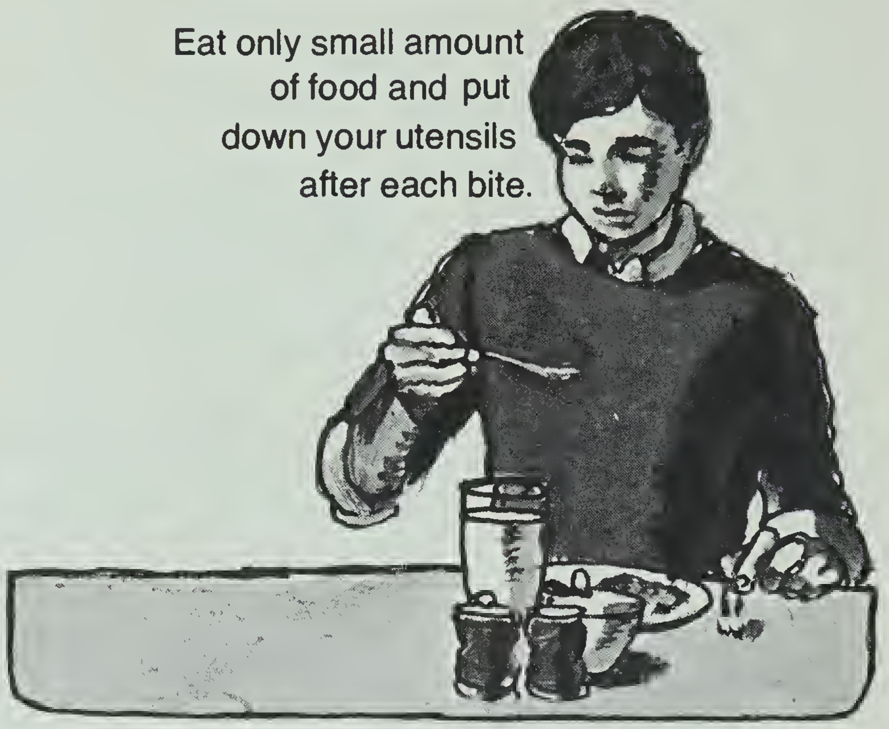
Several weight-control programs take into account the environmental cues that result in overeating. One approach helps people learn self-control when faced with cues related to eating. The basic principle of this approach is for people to have success right away and while they are learning self-control. In other words, they must believe self-control is working!

Here are some ways to control how much you eat.



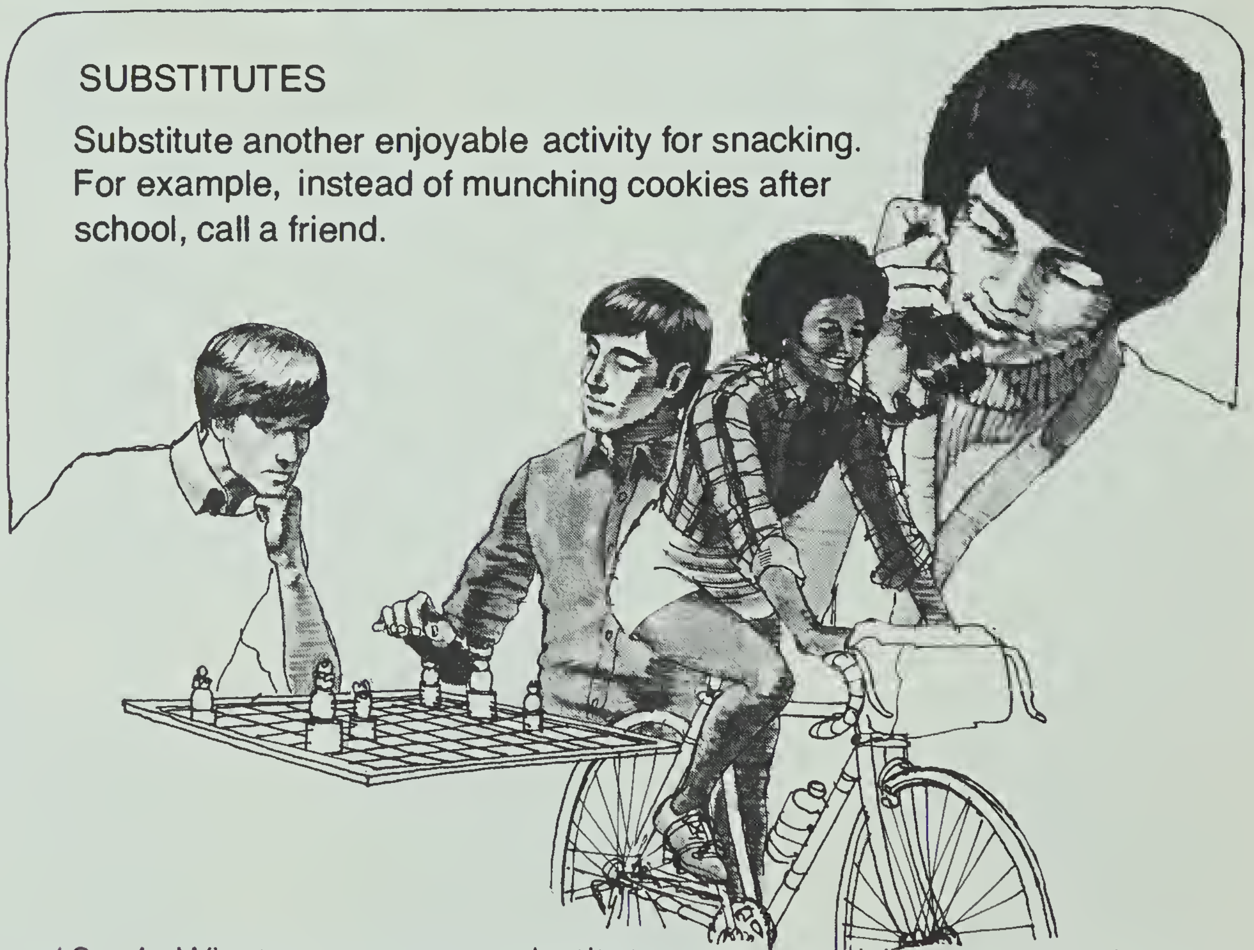
STOP EATING DURING A MEAL

Put down your eating utensils for a few minutes during each meal. Gradually increase the time stopped.



REST BETWEEN SMALL BITES

Eat only small amount of food and put down your utensils after each bite.

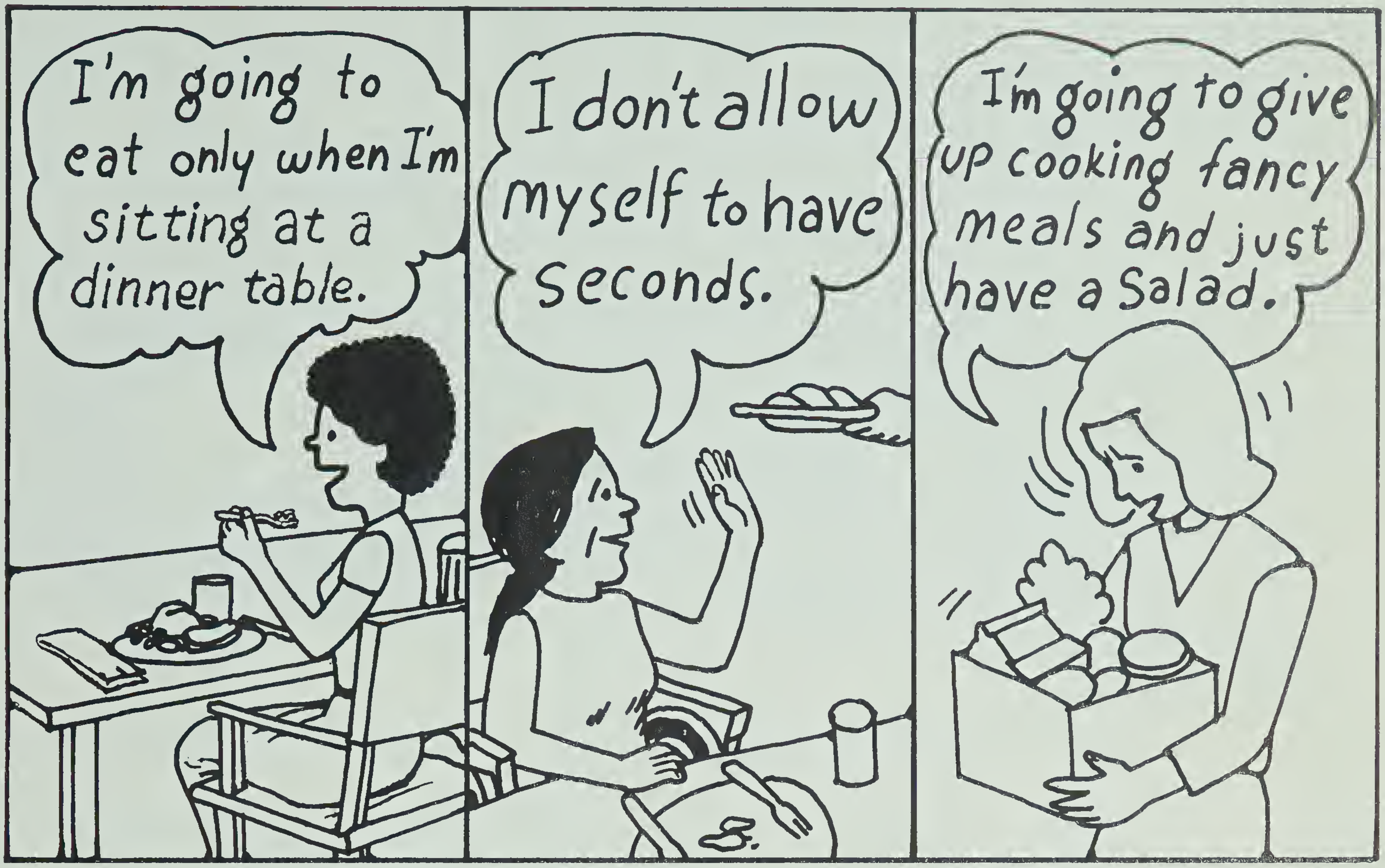


SUBSTITUTES

Substitute another enjoyable activity for snacking. For example, instead of munching cookies after school, call a friend.

- 12–4. What are some substitutes you could use to replace a snack?

In addition to using self-control, overeating can be reduced by certain barriers.


I'm going to eat only when I'm sitting at a dinner table.
I don't allow myself to have seconds.
I'm going to give up cooking fancy meals and just have a salad.

★ **12–5. Describe three barriers that can reduce overeating.**

★ **12–6. What is the basic principle of programs that teach overweight people to use self-control?**

In most weight-control programs, people keep careful records of when, what, and how much food they eat. They also keep records of their weight changes. Losing weight shows that they are having success. And success acts to encourage them to continue the weight-control program. That's why success is the basic principle in weight control.

- 12–7. How does a dieter know he or she is successful in a weight-control program?

Weight-control programs are not always successful. The people involved must really want to lose weight. If they are not highly motivated, they return to their habits of overeating.

Activity 13

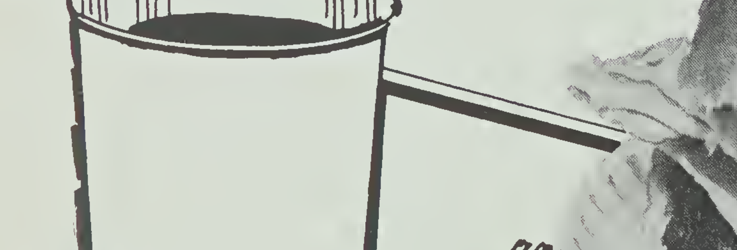
Advanced Planning

If you plan to do Activity 15, you should first be able to do what is stated in the objective for Activity 14.

Activity 14 Page 61

Objective 14–1: Identify the characteristic chemical structures of carbohydrates, proteins, and fats.

Sample Question: This is a diagram of a portion of what kind of molecule?



Activity 15 Page 67

Objective 15–1: Describe how food proteins are converted into human-body-cell proteins.

Sample Question: Which of the following occur inside human body cells when protein is produced?

a. Food proteins are broken down to amino acids.
b. Enzymes are produced.
c. Enzymes enable amino acids to link together.

Answers
14–1. protein **15–1.** a, b, c

Activity 14

Food Chemicals

Most of the foods you eat are chemical compounds called *carbohydrates, fats,* and *proteins*. Your body uses these chemicals for two purposes—to build cells and to provide energy for all cell functions. In order to understand food chemicals, there are a few things you need to know about chemical compounds in general. First, you need to know what *atoms* are, and how they link up to form *molecules.* If you have any doubt about your knowledge, you'd better do *Resource Unit 24.*

Except for water, salt, and a few other things, all the molecules in your body contain carbon, C, atoms. Of course, these molecules also contain atoms of other elements. One carbon atom can link with up to four other atoms. So, carbon can have four *bonds*. For instance, the formula for methane is CH_4. (If you need help understanding chemical symbols and formulas, read *Resource Unit 22*.)

- 14–1. Which kind of atom do all carbohydrates, fats, and proteins contain?

Almost any number of carbon atoms can link together. There can be as few as two, or there can be groups of hundreds or even thousands of carbon atoms in long chains or giant lattices.

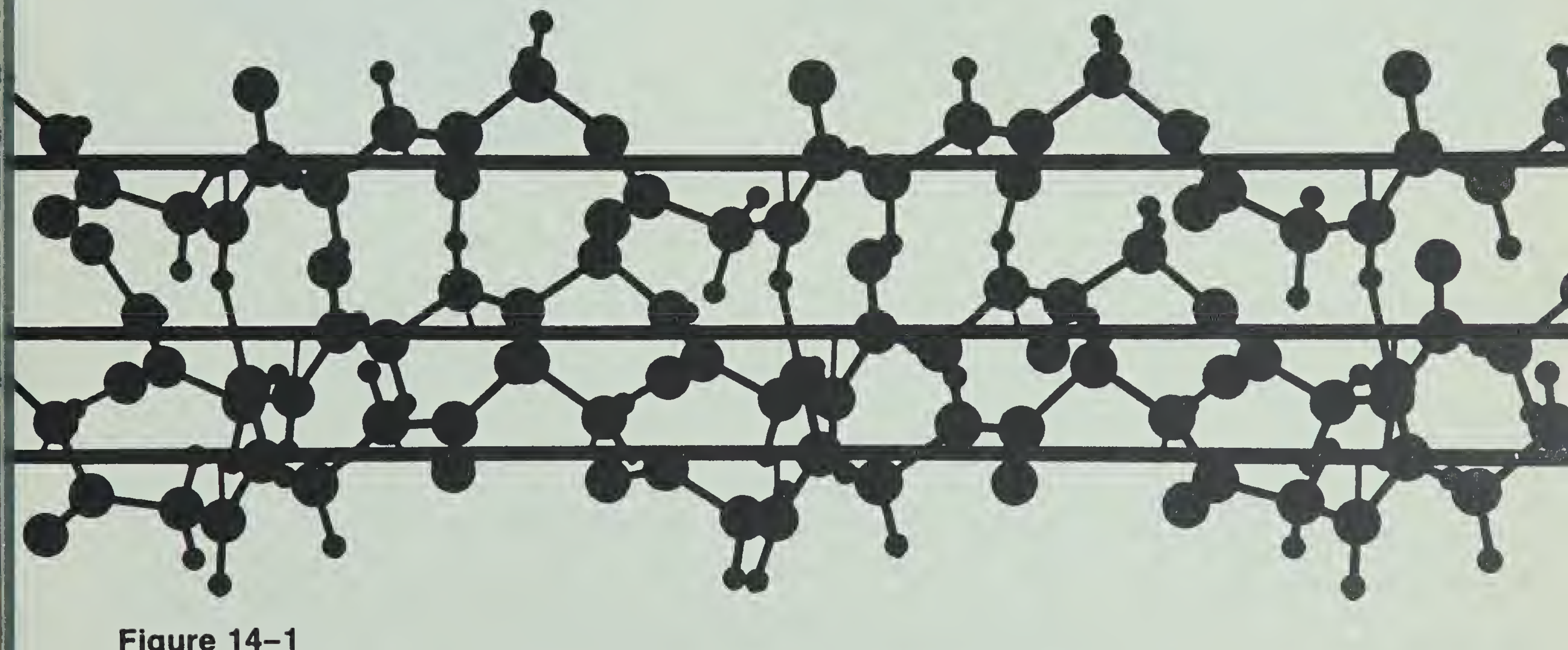
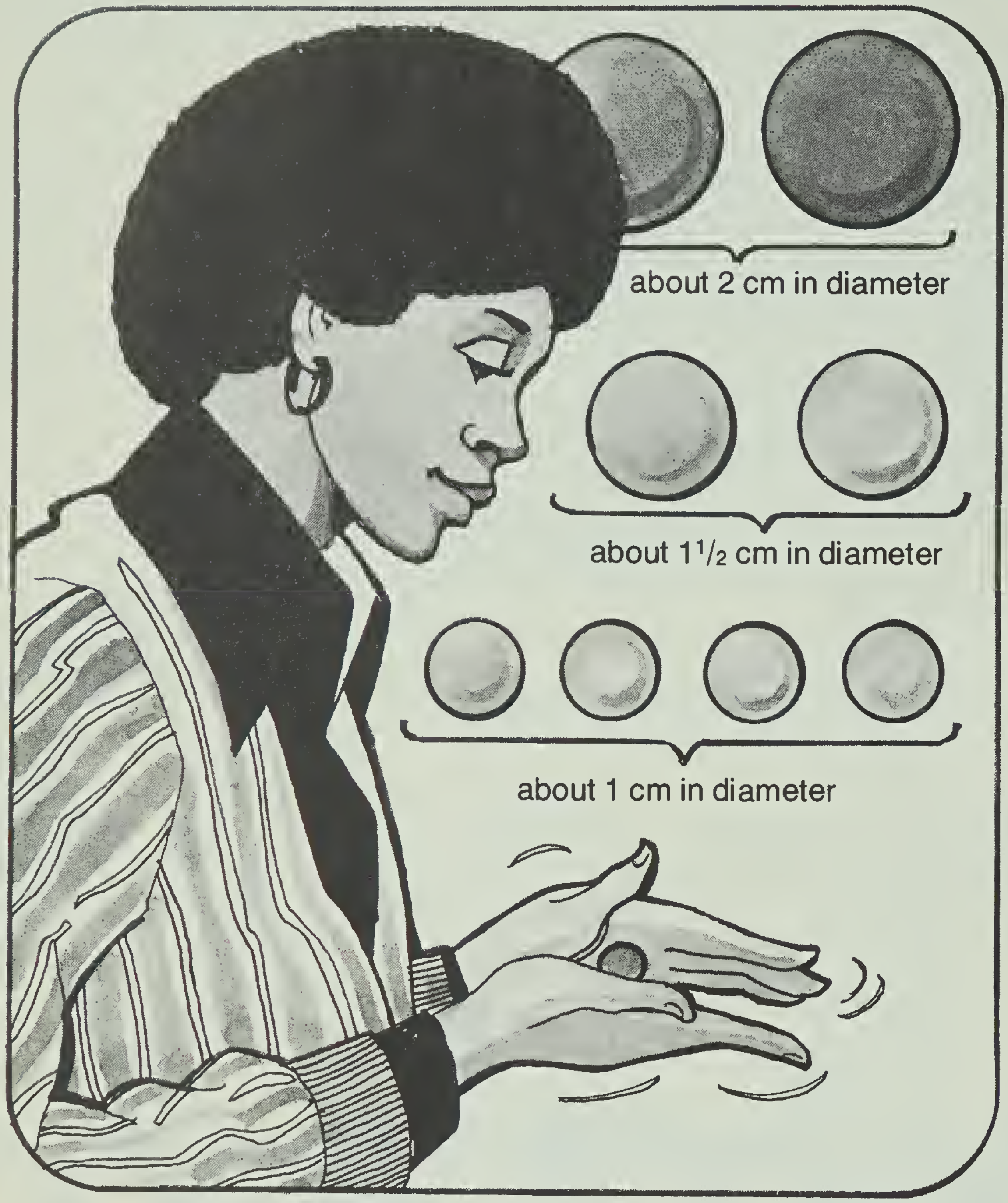


Figure 14–1

In addition to carbon, all carbohydrates, fats, and proteins contain oxygen and hydrogen atoms. You can get an idea of how they bond by using plasticene balls to make a model of the food chemical called *acetic* [ah-SEAT-ik]*acid*. Acetic acid gives vinegar its sour taste. Get pieces of three different colors of plasticene.

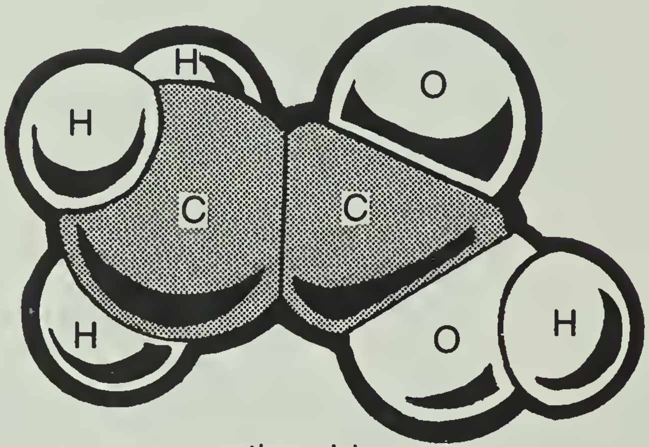


A. Make two balls about 2 cm in diameter from one color of plasticene. They represent carbon atoms.

B. Make two balls about 1½ cm in diameter from a different color to represent oxygen atoms.

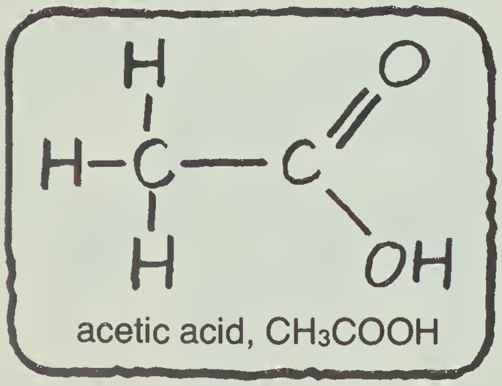
C. With the third color, make four balls about 1 cm in diameter to represent hydrogen atoms.

D. Put the eight plasticene balls together as shown to make a model of acetic acid.



acetic acid

- 14 –2. Which atoms are bonded to the carbon atoms in your model?



acetic acid, CH_3COOH

Figure 14–2

Chemists have a system called *structural formulas* that is easier than drawing pictures of the models of molecules. The structural formula for acetic acid is shown in Figure 14–2. Compare your model with the structural formula. Sometimes atoms that frequently form groups are shown together, like the (OH) in acetic acid.

The structural formula for acetic acid shows a double bond between a carbon and an oxygen atom. Another formula for acetic acid that doesn't show the bonding is CH_3COOH.

Acetic acid was a handy molecule to use to learn about food compounds. But acetic acid is a very simple molecule compared to most of those in the food you eat.

CARBOHYDRATES

Some carbohydrates have very large molecules. Figure 14–3 shows the structural formula for one of the simplest carbohydrates—a "simple" sugar called *glucose* [GLUE-kos].

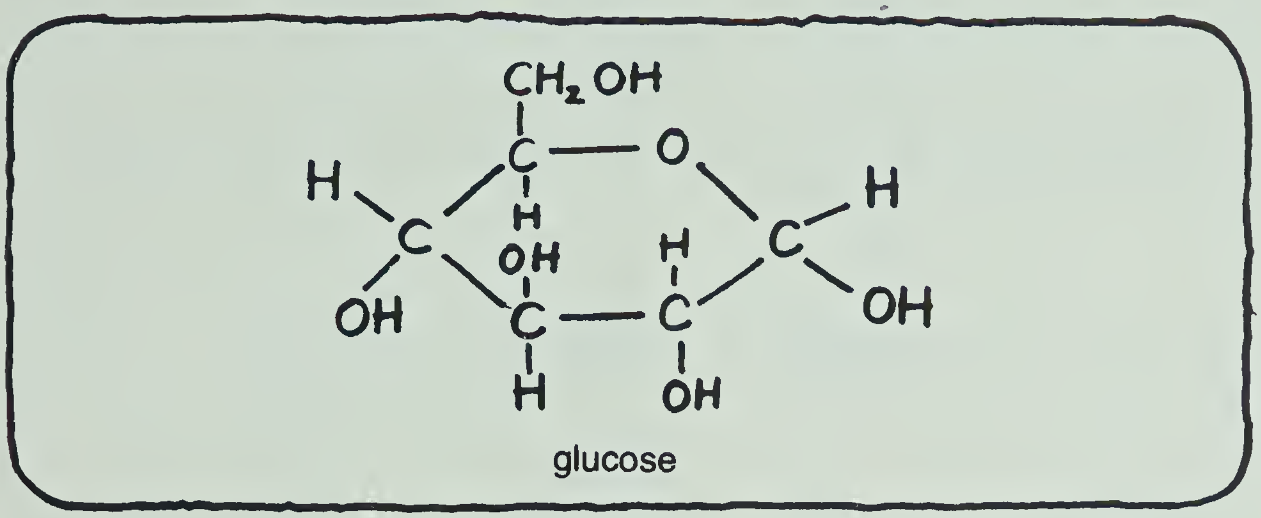


Figure 14–3

All carbohydrates have twice as many hydrogen atoms as oxygen atoms. Count the hydrogen and oxygen atoms in glucose. Also, note the ringlike structure of the molecule.

★ 14–3. What are the three kinds of atoms in carbohydrates (sugars and starches)?

Carbohydrates called *starches* are giant molecules composed of simple sugars linked together. One kind of starch is a long chain of glucose molecules.

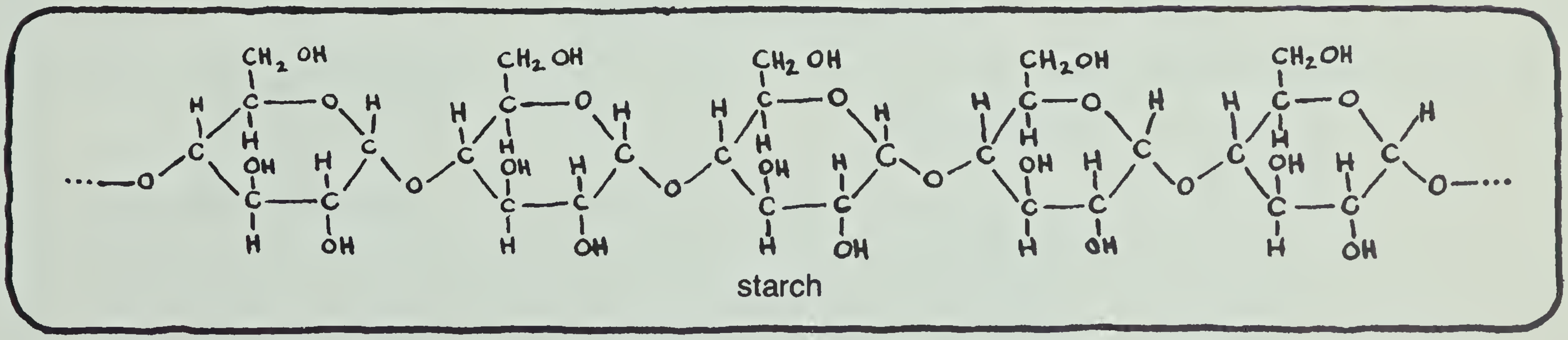


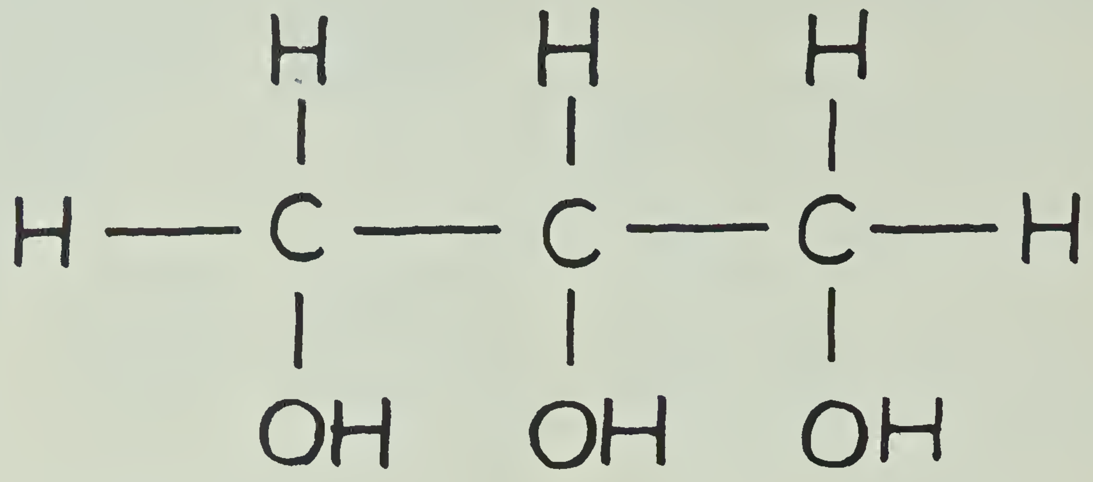
Figure 14–4

- 14–4. Starches are made of what kind of simple compounds?

FATS

All fat molecules are made of two kinds of chemical compounds—*glycerol* and *fatty acids*.

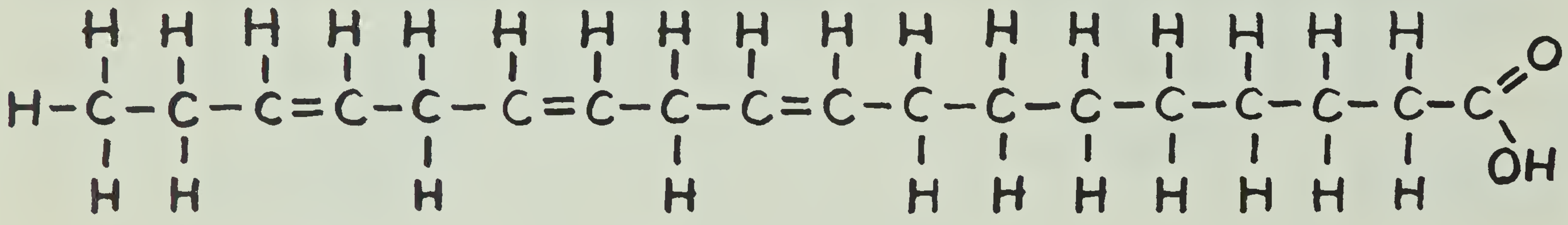
Glycerol can be thought of as the backbone of a fat molecule.



$$\begin{array}{ccccccccc} & & H & & H & & H & & \\ & & | & & | & & | & & \\ H & - & C & - & C & - & C & - & H \\ & & | & & | & & | & & \\ & & OH & & OH & & OH & & \end{array}$$

glycerol

All fatty acids are a long chain of carbon atoms with a (COOH) group at one end. The (COOH) group can link up to a glycerol molecule. Remember, a carbon atom can bond with four other atoms.



$$\begin{array}{*{37}{c}} & & H & & H & & H & & H & & H & & H & & H & & H & & H & & H & & H & & H & & H & & H & & H & & H & & H & & O \\ & & | & & | & & | & & | & & | & & | & & | & & | & & | & & | & & | & & | & & | & & | & & | & & | & & | & & \Vert \\ H & - & C & - & C & - & C & = & C & - & C & - & C & = & C & - & C & - & C & = & C & - & C & - & C & - & C & - & C & - & C & - & C & - & C & - & C \\ & & | & & | & & & & & & | & & & & & & | & & & & & & | & & | & & | & & | & & | & & | & & | & & | \\ & & H & & H & & & & & & H & & & & & & H & & & & & & H & & H & & H & & H & & H & & H & & H & & OH \end{array}$$

linolenic acid (a fatty acid)

Figure 14–5

In Figure 14–5, note that some of the carbon atoms in linolenic acid [lin-oh-LEE-nik] are bonded with four other atoms and some are not. If each carbon atom in a fat molecule is bonded to four other atoms, the molecule is said to be *saturated*. If there are carbon-to-carbon *double bonds*, the fat molecule is *unsaturated*. *Polyunsaturated* fats are foods that are made of fat molecules in which there are many double bonds.

In a fat molecule three fatty acids are linked to a glycerol molecule. For each fatty acid-glycerol bond, a molecule of water is formed.

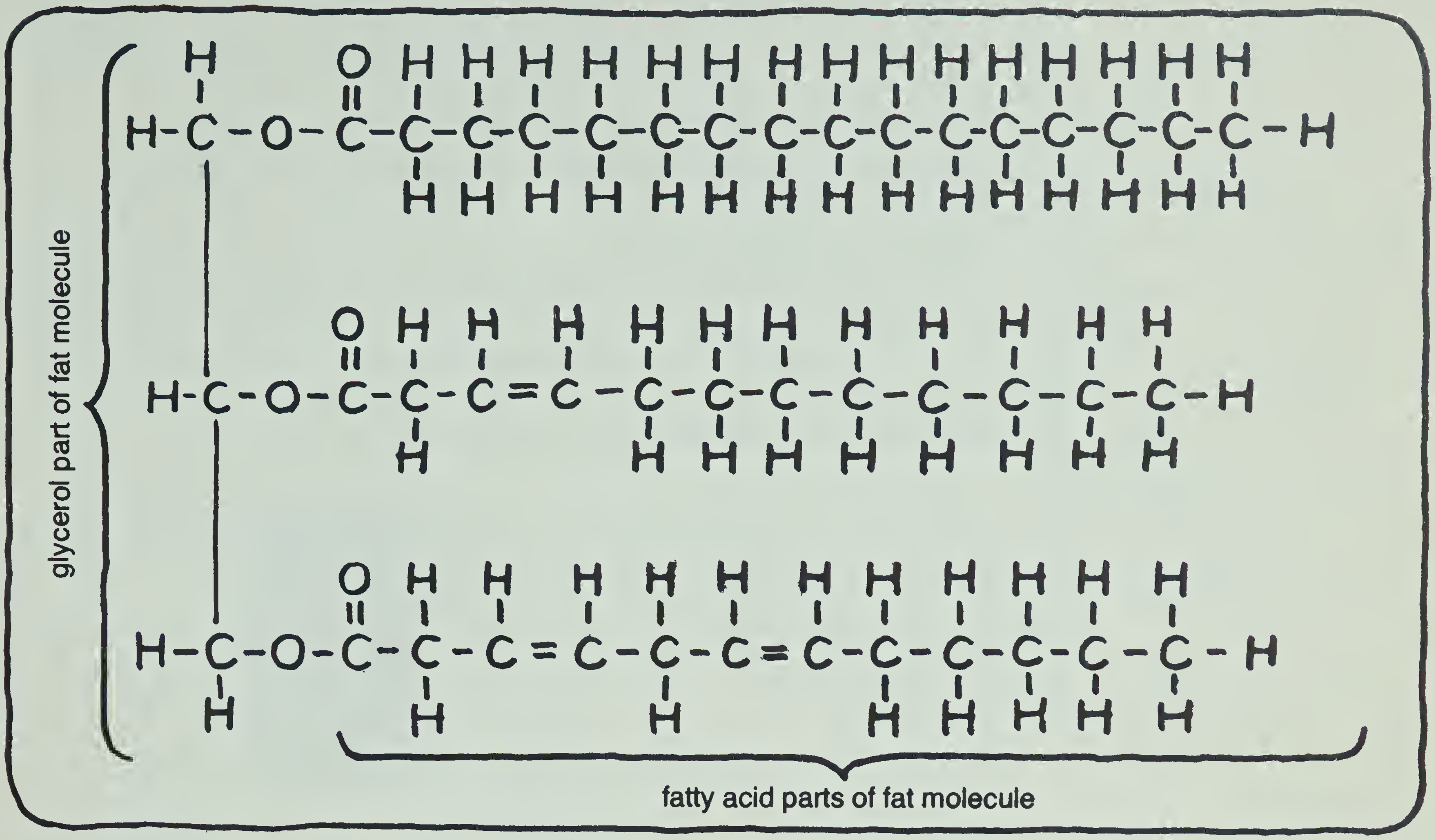

glycerol part of fat molecule
fatty acid parts of fat molecule

Figure 14–6

- 14–5. From what two substances are fat molecules formed?

★ 14–6. Which molecule in Figure 14–7 is a fat molecule? A carbohydrate molecule?

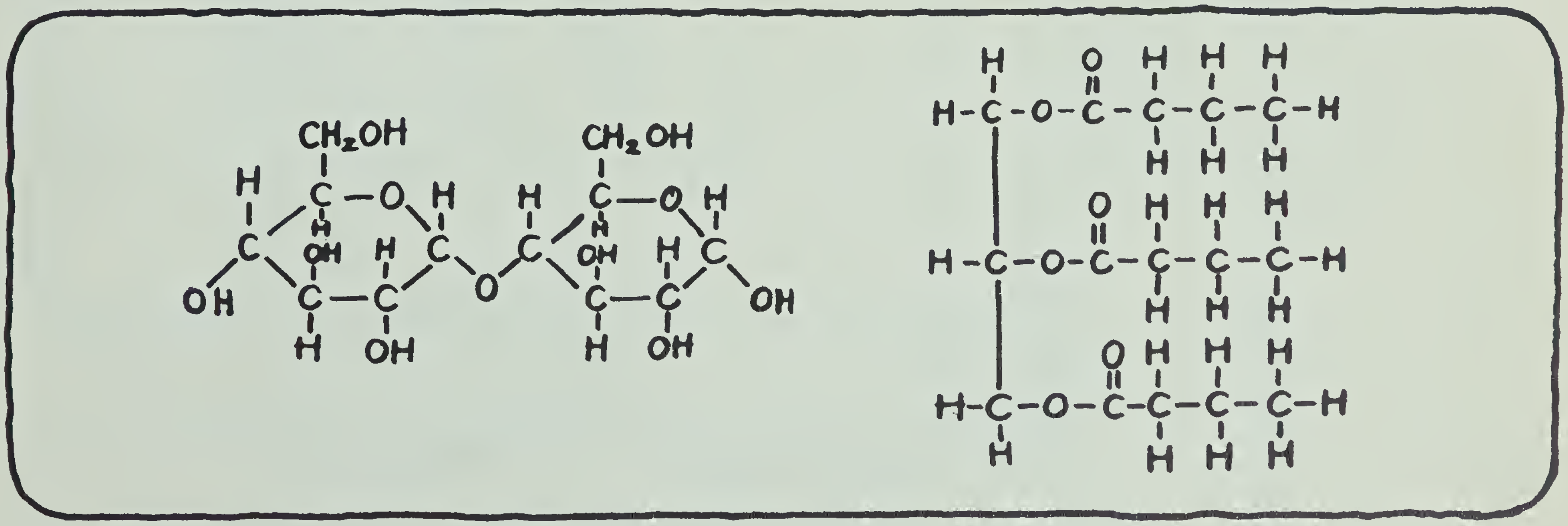


Figure 14–7

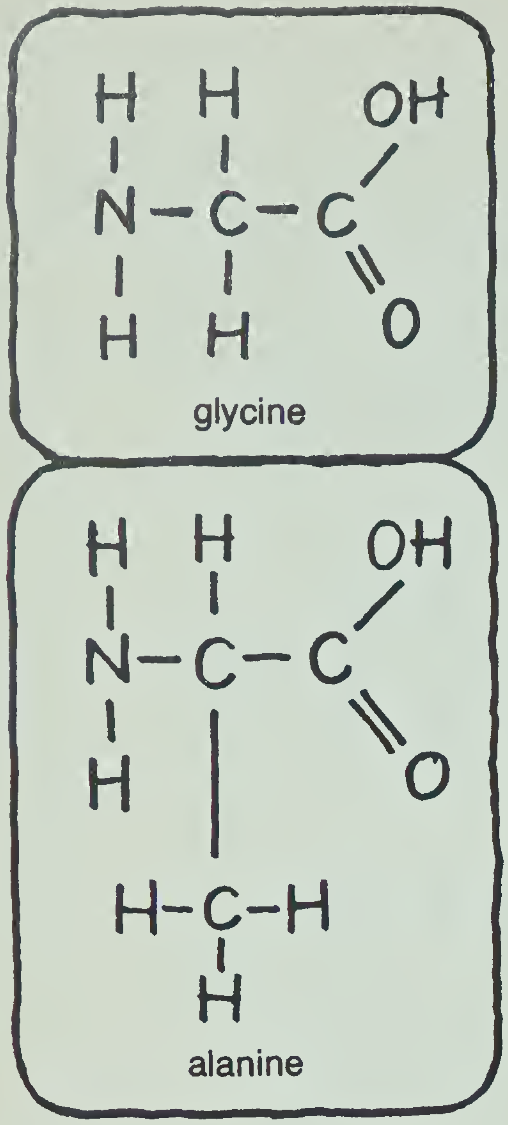


Figure 14–8

PROTEINS

Protein molecules are very large compared to most other molecules. They can have thousands and even tens of thousands of atoms, and they are made of basic building blocks called *amino* [a-ME-no] *acids*. Some proteins contain as many as 5000 amino acids in long chains. About twenty different amino acids are found in proteins. Each amino acid contains carbon, hydrogen, oxygen, and nitrogen atoms, and some also contain phosphorus and sulfur atoms. Two amino acids are shown in Figure 14–8.

A protein molecule has hundreds of nitrogen and carbon atoms in its basic chain. Figure 14-9 shows several amino acids joined together to form a small part of one protein molecule. The shaded part is a portion of an amino acid. As you can see, long chains can be attached to a carbon in each amino acid.

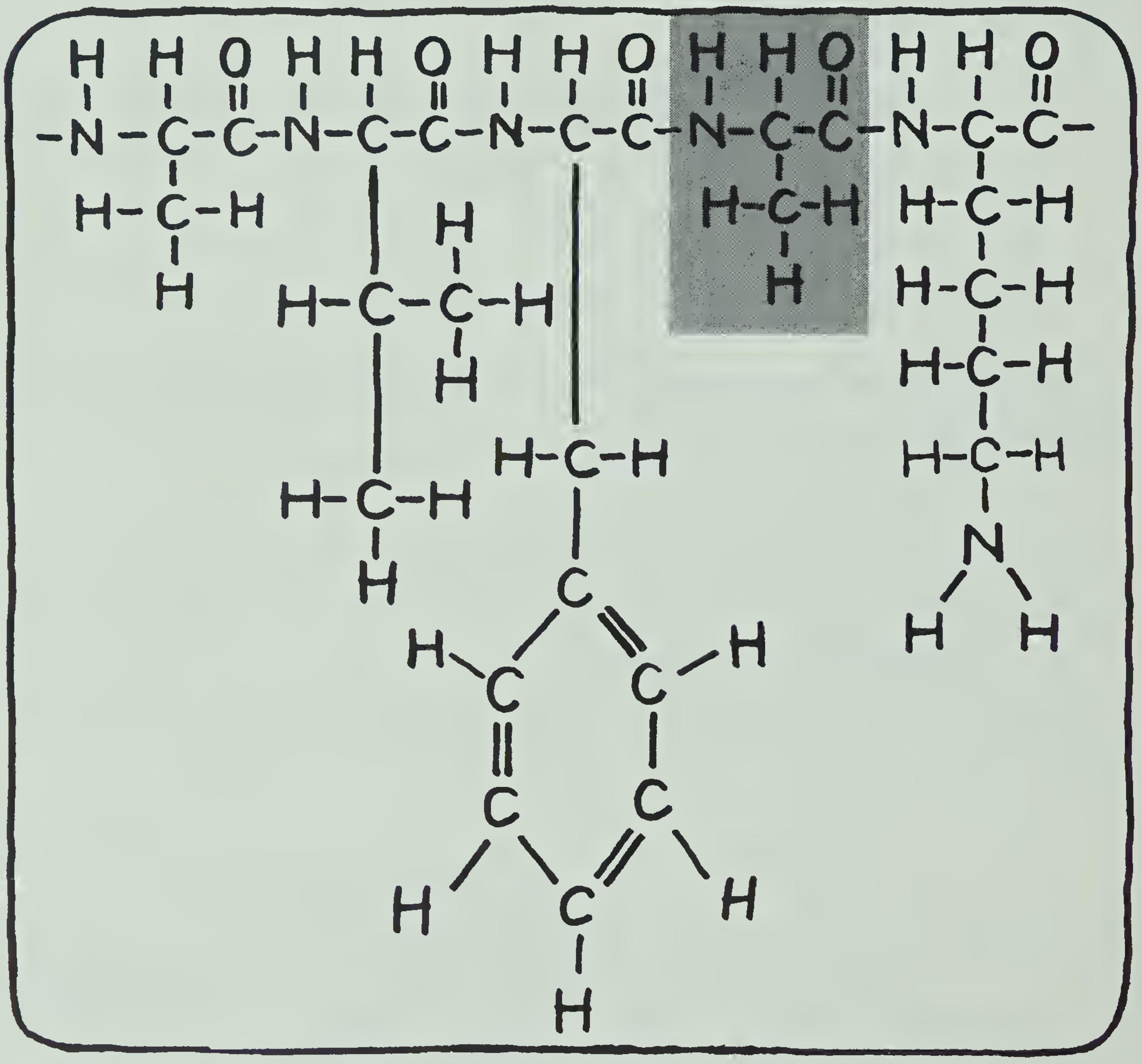
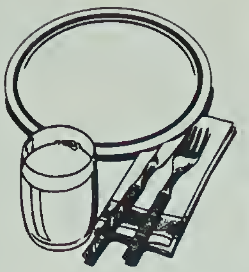


Figure 14–9

★ **14–7. Which kind of atom in proteins is *not* found in carbohydrates or fats?**

- 14–8. What are the basic building blocks of all proteins?



Activity 15

From Food Protein to Body Protein

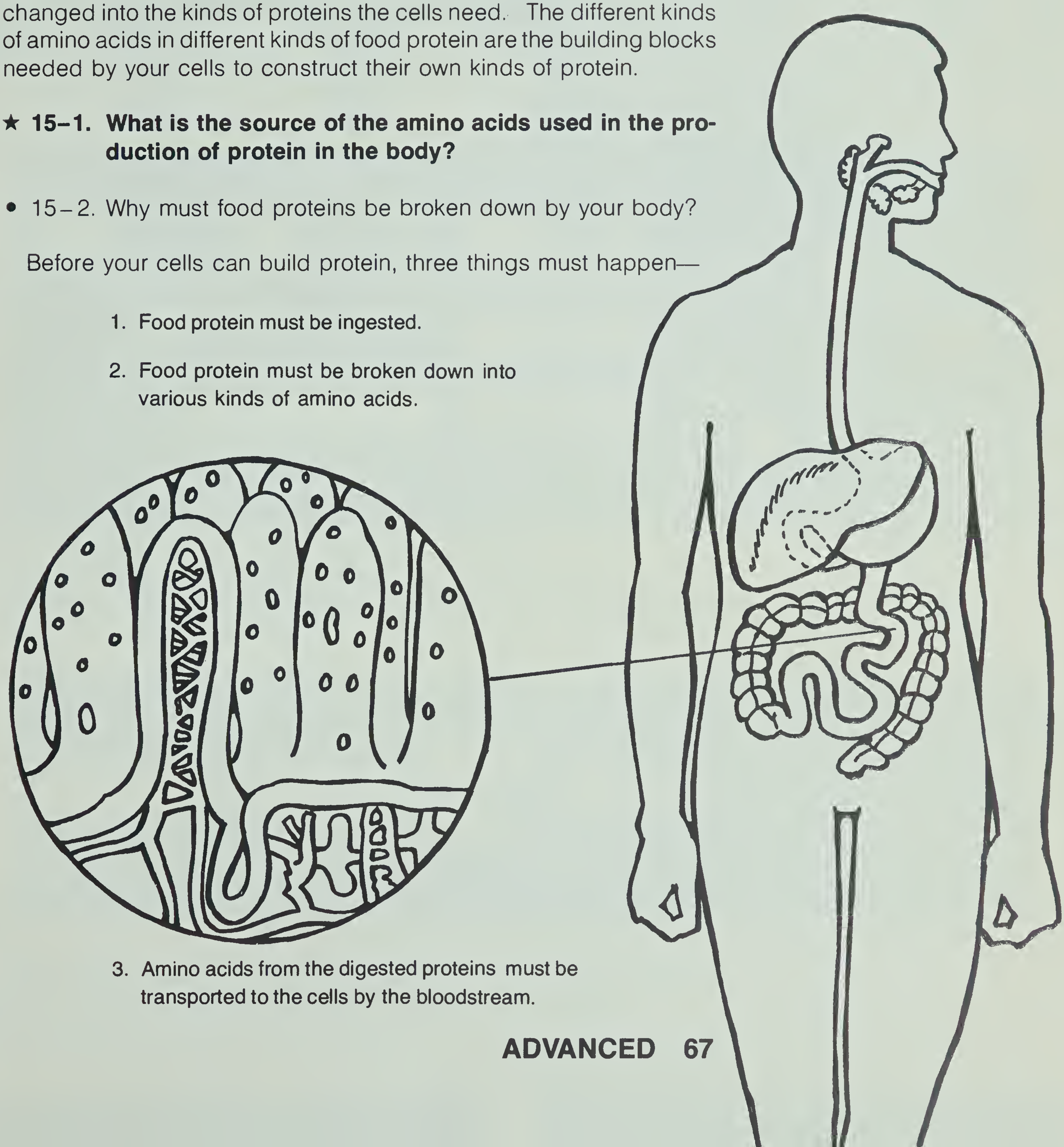
Your body cells are made mostly of protein molecules that are built from amino acids. The protein in food is also built from amino acids. But food protein cannot be used by your body cells "as is." It must be changed into the kinds of proteins the cells need. The different kinds of amino acids in different kinds of food protein are the building blocks needed by your cells to construct their own kinds of protein.

★ **15–1. What is the source of the amino acids used in the production of protein in the body?**

- 15–2. Why must food proteins be broken down by your body?

Before your cells can build protein, three things must happen—

1. Food protein must be ingested.
2. Food protein must be broken down into various kinds of amino acids.



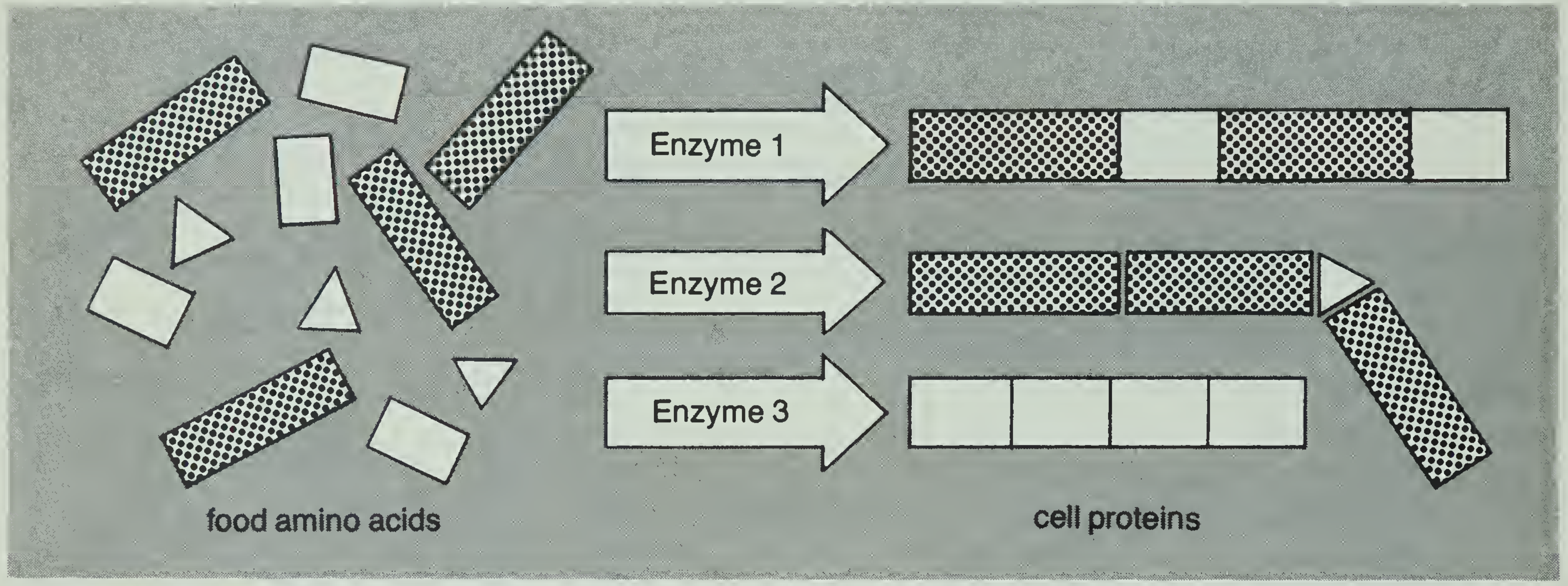
3. Amino acids from the digested proteins must be transported to the cells by the bloodstream.

When the cells have received the different kinds of amino acids, they can begin building proteins. To do this constructing, special chemicals called *enzymes* [EN-zimes] are also needed. The enzymes are produced within the body cells and control the rate of the chemical changes that occur during protein synthesis. Without them, the chemical reactions would occur so slowly that the cell would die.

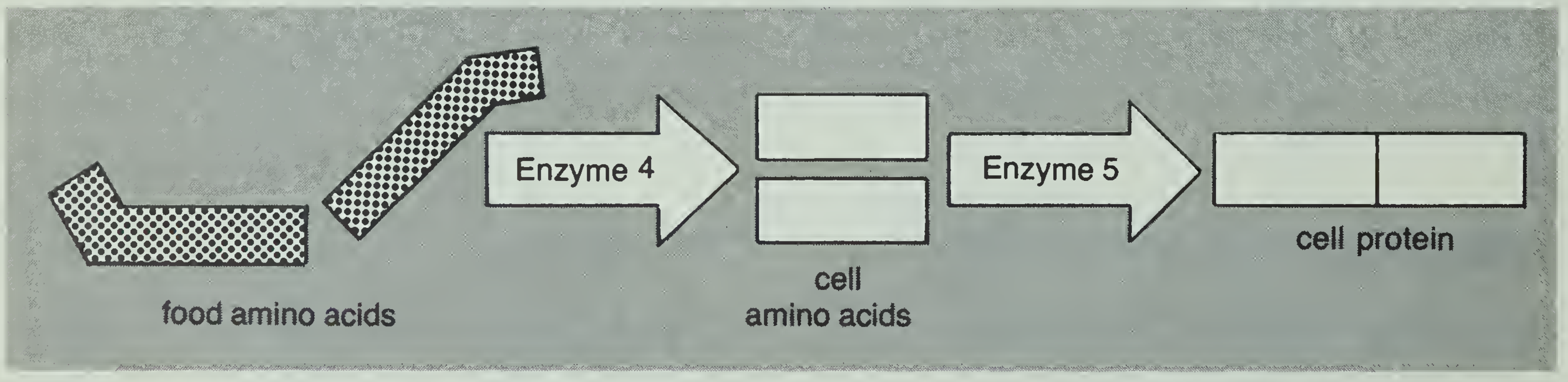
★ 15–3. What two things must a cell have to make the proteins it needs?

How does a cell construct different kinds of proteins? There are two main ways—

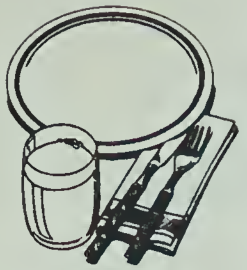
By using enzymes to join different kinds of food amino acids in different ways.



By using enzymes to change food amino acids into different amino acids, and then using other enzymes to join these new amino acids in different ways.



★ 15–4. In your own words, describe how food protein is converted into cell protein in the human body.

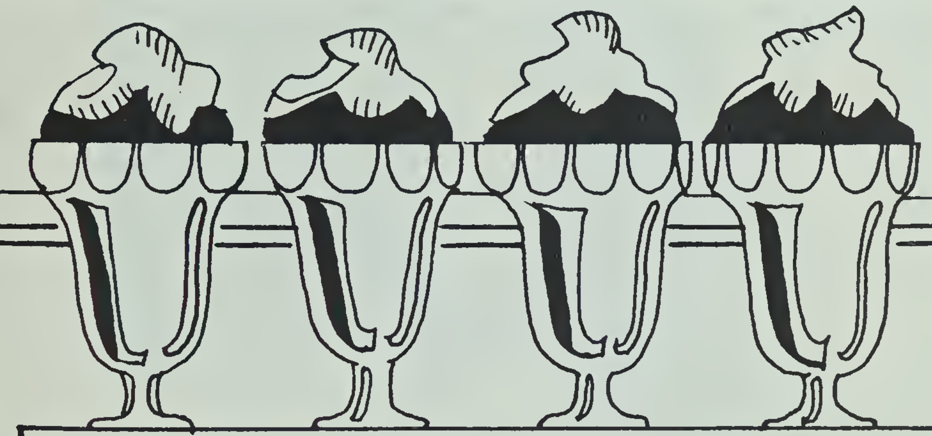


Activity 16
Excursion Planning

Nutrition Labeling

Activity 17 Page 70

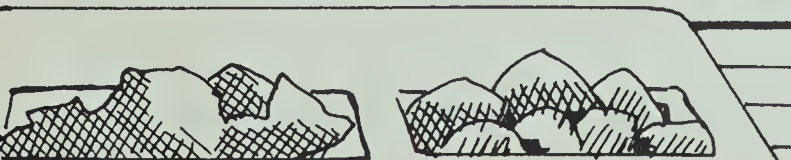
Food package labels have a lot to say, but you have to look closely. This excursion activity shows you some things to look for on food labels.

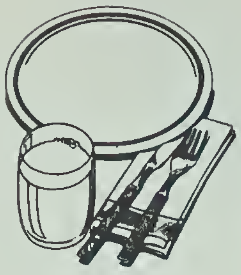


A Perfect Food?

Activity 18 Page 72

Is there such a thing as a perfect food? See for yourself by doing chemical tests for proteins, fats, and carbohydrates.



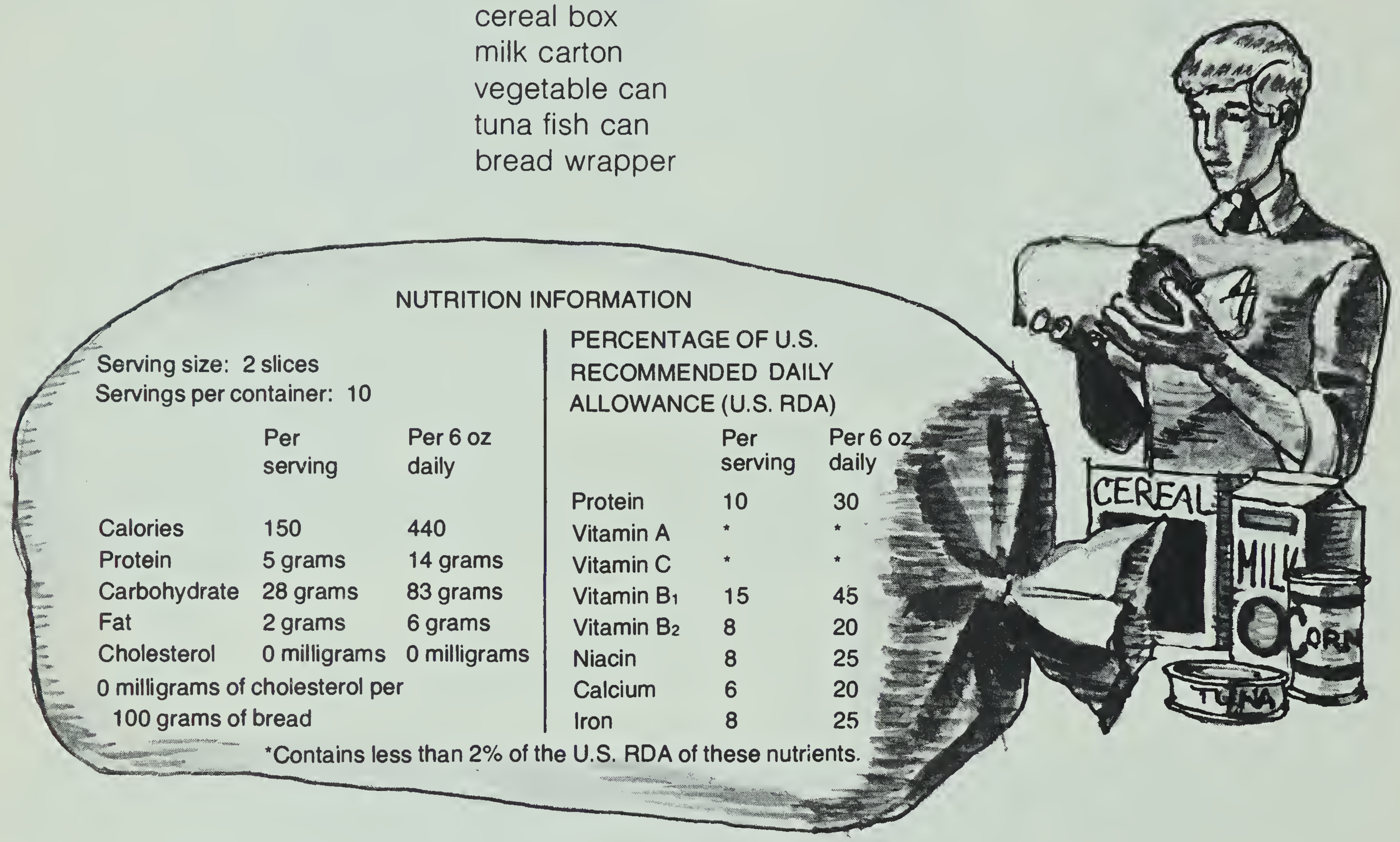


Activity 17
Nutrition Labeling

Maybe you don't judge a book by its cover, but packages are something else. The labels on food packages can tell you a lot. From them you can find out what's inside the package.

To see what you can learn from labels, get the following materials:

cereal box
milk carton
vegetable can
tuna fish can
bread wrapper



NUTRITION INFORMATION

Serving size: 2 slices
Servings per container: 10

	Per serving	Per 6 oz daily
Calories	150	440
Protein	5 grams	14 grams
Carbohydrate	28 grams	83 grams
Fat	2 grams	6 grams
Cholesterol	0 milligrams	0 milligrams

0 milligrams of cholesterol per 100 grams of bread

PERCENTAGE OF U.S. RECOMMENDED DAILY ALLOWANCE (U.S. RDA)

	Per serving	Per 6 oz daily
Protein	10	30
Vitamin A	*	*
Vitamin C	*	*
Vitamin B_1	15	45
Vitamin B_2	8	20
Niacin	8	25
Calcium	6	20
Iron	8	25

*Contains less than 2% of the U.S. RDA of these nutrients.

Look at the labels on each of the packages. Locate the sections headed *Nutrition Information* and *Percentage of U.S. Recommended Daily Allowances (U.S. RDA)*.

★ **17–1. What kind of information is given under the heading *Nutrition Information?***

• 17–2. Do all the labels give the recommended daily allowances for nutrients?

★ **17–3. Which of the three essential nutrients (proteins, fats, and carbohydrates) are included under the U.S. RDA heading?**

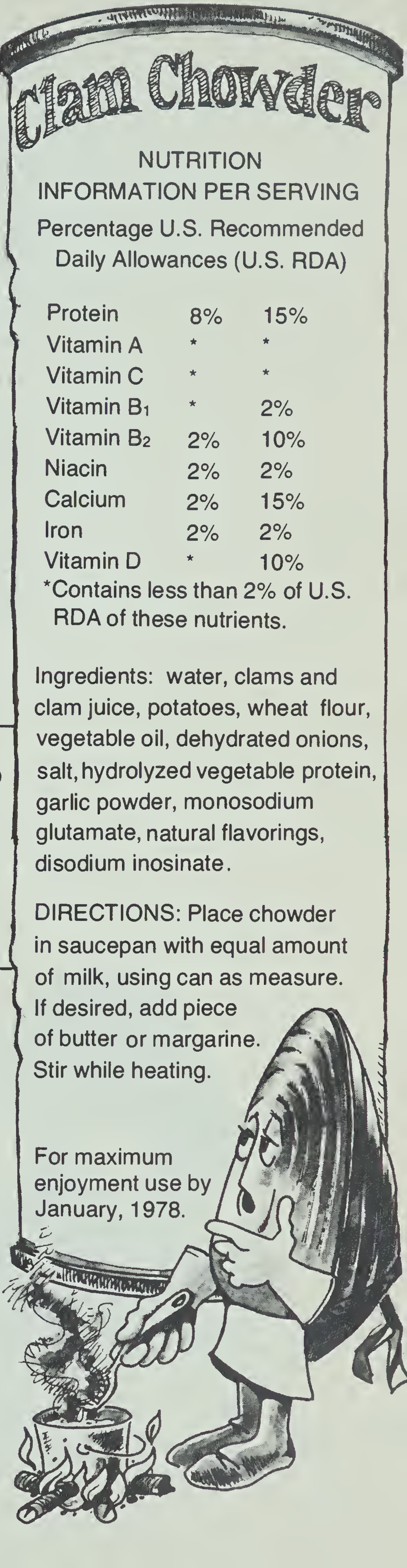
- 17–4. Look at the label on the bread wrapper, under the U.S. RDA heading.
  a. Which vitamins are listed?
  b. Which minerals are listed?

- 17–5. On the label of the cereal box, are there any vitamins and minerals there that are not listed on the bread wrapper? If so, what are they?

- 17–6. What happens to the U.S. RDA values when milk is added to the cereal?

★ **17–7. On some of the labels, the percentage of nutrient has an asterisk (*). What does the asterisk tell you?**

★ **17–8 For one serving, which food (cereal, bread, tuna fish, vegetable, or milk) has the highest percentage of the U.S. RDA for protein? For vitamin B_1? For vitamin C?**



NUTRITION
INFORMATION PER SERVING
Percentage U.S. Recommended
Daily Allowances (U.S. RDA)

Protein	8%	15%
Vitamin A	*	*
Vitamin C	*	*
Vitamin B_1	*	2%
Vitamin B_2	2%	10%
Niacin	2%	2%
Calcium	2%	15%
Iron	2%	2%
Vitamin D	*	10%

*Contains less than 2% of U.S. RDA of these nutrients.

Ingredients: water, clams and clam juice, potatoes, wheat flour, vegetable oil, dehydrated onions, salt, hydrolyzed vegetable protein, garlic powder, monosodium glutamate, natural flavorings, disodium inosinate.

DIRECTIONS: Place chowder in saucepan with equal amount of milk, using can as measure. If desired, add piece of butter or margarine. Stir while heating.

For maximum enjoyment use by January, 1978.

CLAM CHOWDER

Serving size: 1 cup when prepared as directed and using homogenized Vitamin D milk.

Servings Per Container: 4

	CONDENSED	CONDENSED WITH MILK
Calories	60	140
Protein	5 grams	9 grams
Carbohydrate	9 grams	15 grams
Fat	1 gram	5 grams

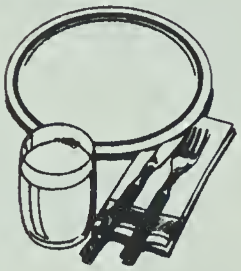
Nutrient labeling is important to you as a consumer. The Food and Drug Administration, a consumer-protection agency, has set certain regulations. Foods that make special claims or are sold as "enriched," "fortified," or "diet foods" must have certain information on the labels.

The required information includes the serving size of the food and the number of servings in the package. The calorie, protein, carbohydrate, and fat content per serving must also be listed. Usually the amounts of important minerals and vitamins must also be included.

Ingredients listed on food packages tell you what's in the food. Ingredients are listed in order by weight, from most to least, and include additives. Additives are colorings, flavorings, and preservatives.

- 17–9. Which foods can you recognize from the ingredients?
    a. carbonated water, sugar, citric acid, sodium citrate, flavor derived from lemon and lime oils
    b. corn syrup, coconut, sugar, cocoa powder, hydrogenated vegetable oil, chocolate, whey powder, salt, vanilla, lecithin, artificial flavor, egg white solids
    c. soybean oil, egg, vinegar, water, egg yolk, salt, sugar, lemon juice, paprika, garlic, onion, calcium disodium EDTA, natural flavor
    d. golden roasted peanuts, dextrose, hardened vegetable oil, salt, peanut oil
    e. mustard seed, vinegar, water, salt, flavorings, tumeric, spices

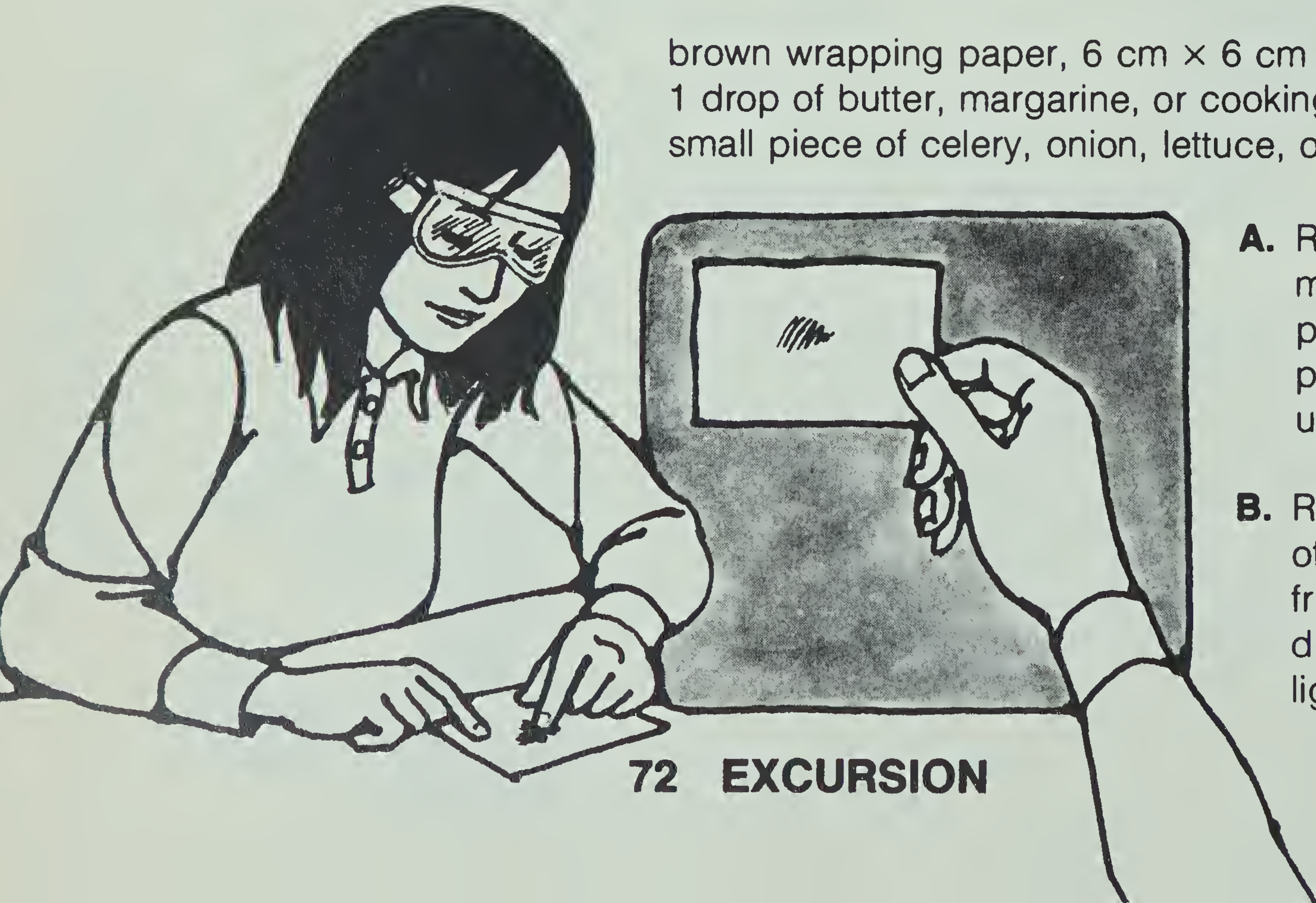
You can check your answer to Question 17–9 here. In order, from (a) to (e), the answer is: soft drink, candy bar, mayonnaise, peanut butter, prepared mustard.



Activity 18
A Perfect Food?

You've read a lot about the nutrients that are found in foods. There are some tests you can do to find out what nutrients foods contain. For the first test you will need the following materials:

brown wrapping paper, 6 cm × 6 cm
1 drop of butter, margarine, or cooking oil
small piece of celery, onion, lettuce, or fruit



A. Rub a tiny amount of butter, margarine, or cooking oil on a piece of brown wrapping paper. Then hold the paper up to light.

B. Repeat Step A using a piece of celery, onion, lettuce, or fruit. Give the spot time to dry before holding it up to light.

- 18–1. Describe how the spots look when held up to light.

- 18–2. Which spot dries up and which does not?

A greasy-looking spot that lets light shine through the paper shows fat is present.

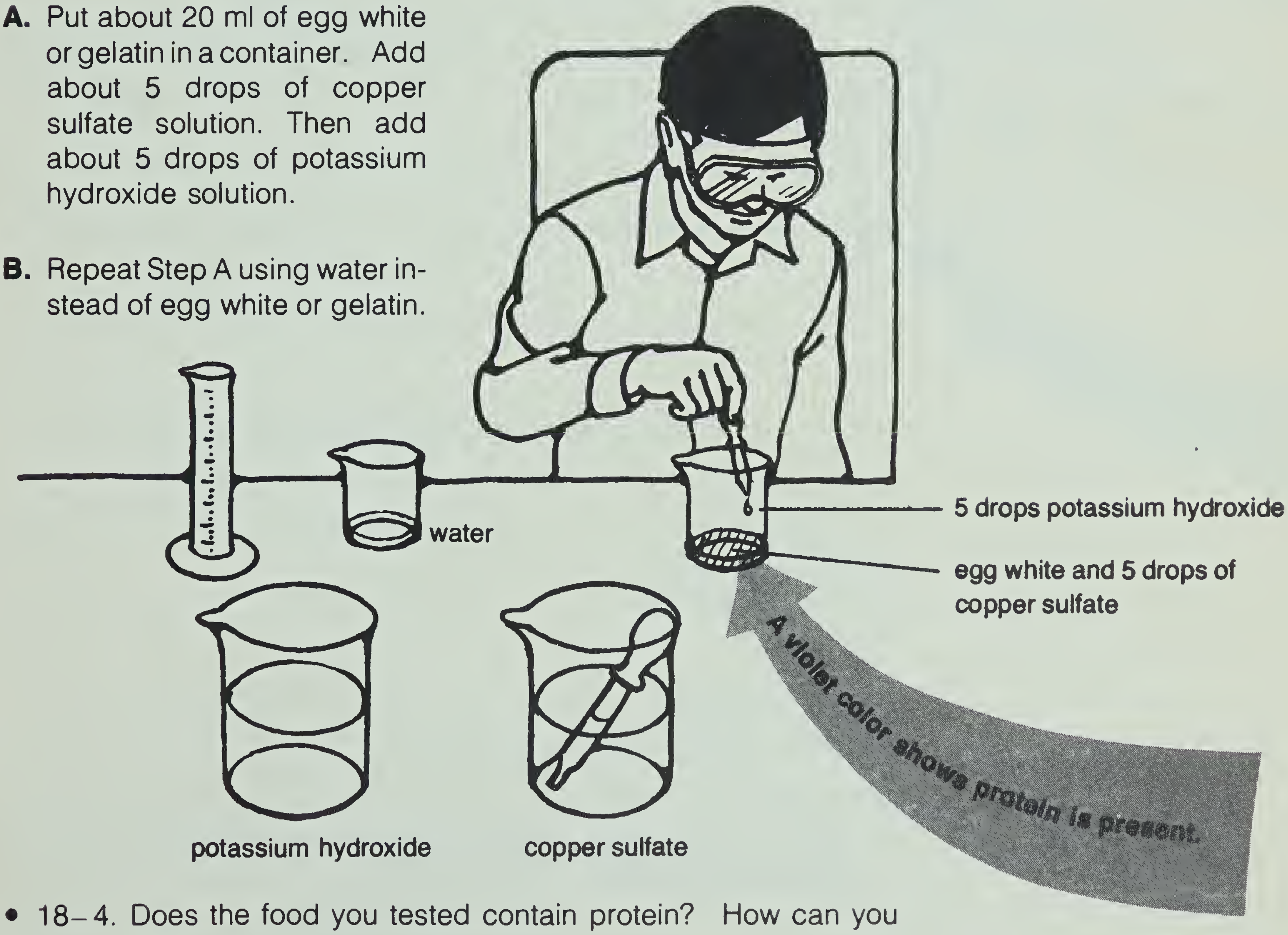
- 18–3. Of the foods you tested, which contain fat?

To try out a test for protein, you will need the following materials:

safety goggles
4 containers, 30 ml
graduated cylinder
egg white or unflavored gelatin
copper sulfate, $CuSO_4$, 5% solution
potassium hydroxide, KOH, 5% solution
2 medicine droppers

A. Put about 20 ml of egg white or gelatin in a container. Add about 5 drops of copper sulfate solution. Then add about 5 drops of potassium hydroxide solution.

B. Repeat Step A using water instead of egg white or gelatin.

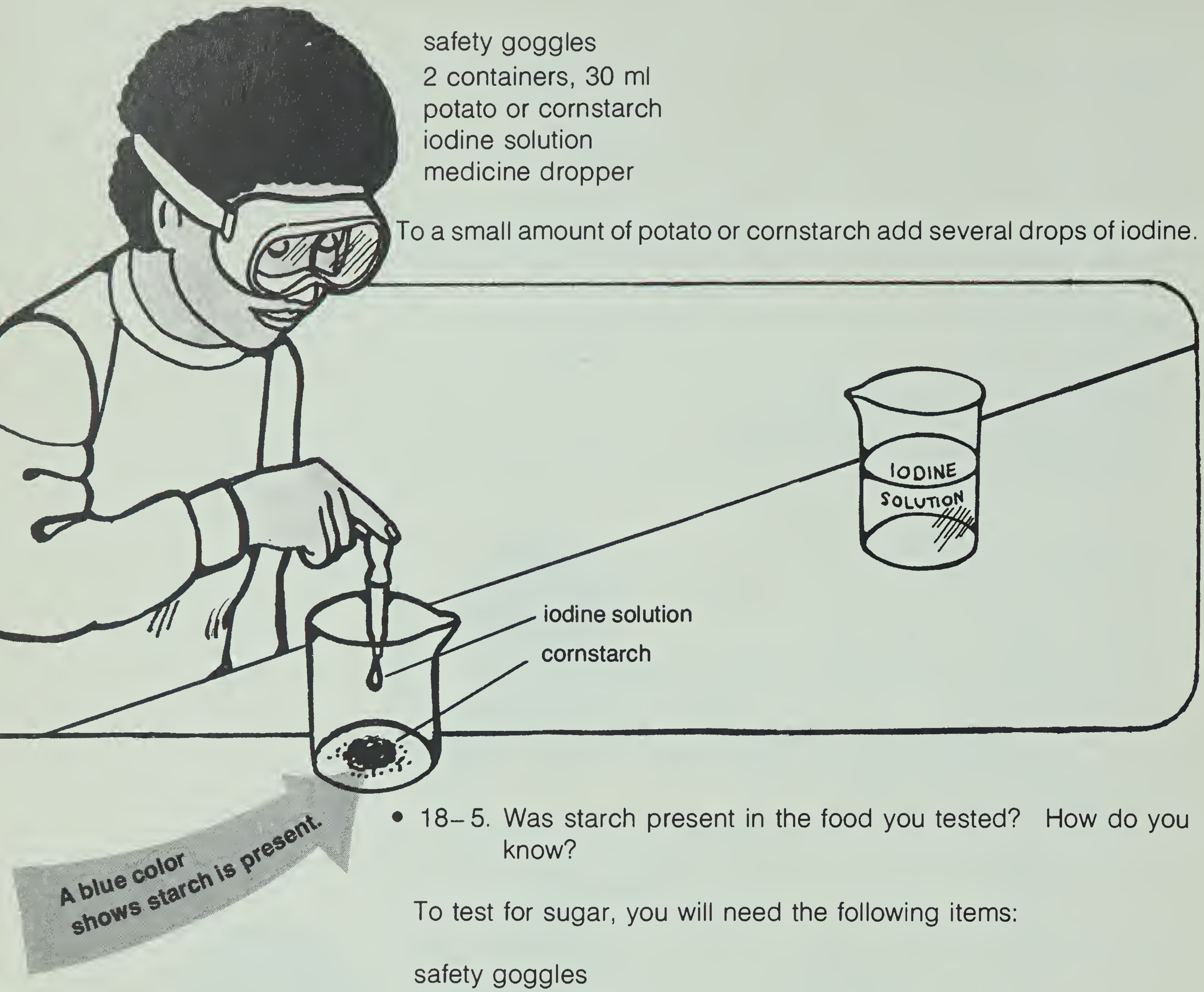

water
5 drops potassium hydroxide
egg white and 5 drops of copper sulfate
A violet color shows protein is present.
potassium hydroxide
copper sulfate

- 18–4. Does the food you tested contain protein? How can you tell?

For carbohydrates there are different tests for starch and sugar. The test for starch requires the following items:

safety goggles
2 containers, 30 ml
potato or cornstarch
iodine solution
medicine dropper

To a small amount of potato or cornstarch add several drops of iodine.



A blue color shows starch is present.

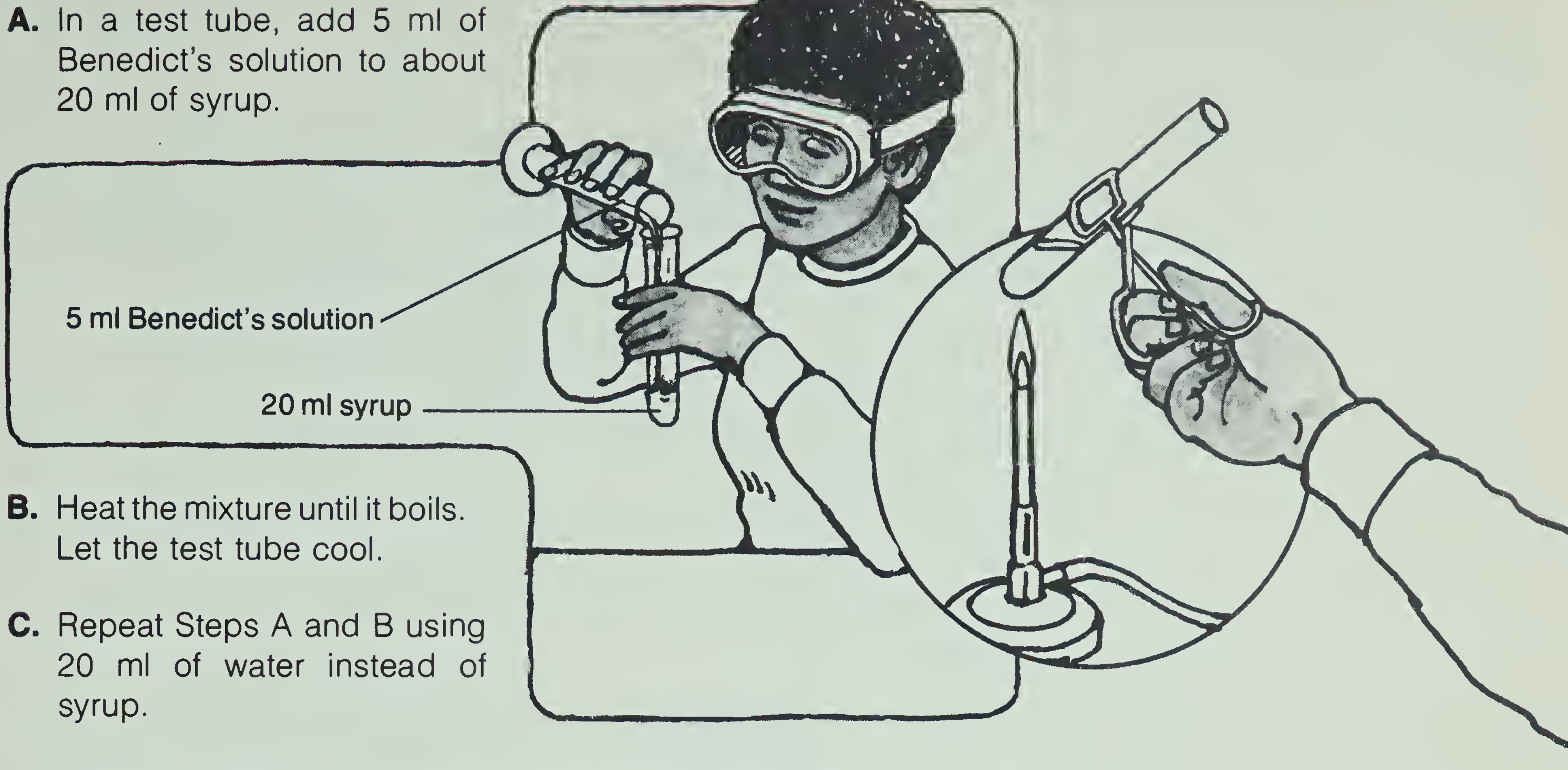
- 18–5. Was starch present in the food you tested? How do you know?

To test for sugar, you will need the following items:

safety goggles
3 containers, 30 ml
graduated cylinder
Benedict's solution
corn syrup
test tube
test-tube clamp
Bunsen burner or other heat source

CAUTION **Don't point the open end of the tube toward anyone. Be sure to wear your safety goggles.**

A. In a test tube, add 5 ml of Benedict's solution to about 20 ml of syrup.



B. Heat the mixture until it boils. Let the test tube cool.

C. Repeat Steps A and B using 20 ml of water instead of syrup.

A color change upon cooling indicates a sugar is present. The color may change to green, yellow orange, or red. The more sugar, the more reddish the color.

- 18–6. What was the color of the syrup mixture after cooling?

- 18–7. Was the water mixture the same color? What reason can you give for this?

THE MOST PERFECT FOOD

Milk is often called "The most perfect food." It's often the only food babies get the first weeks of their lives.

- 18–8. If it is a "perfect food," what three major nutrients should milk contain?

To see if milk has these nutrients, you can test samples of milk as you tested the butter, egg, potato, syrup, or other materials. You will probably need 30–45 minutes to do the four tests. Don't begin unless you have time to finish all four tests. You will need the equipment and solutions you used before and the following materials:

cream
whole milk, fresh or powdered

Before you start, copy the table in Figure 18–1 in your notebook. Use it to record your data after doing each test.

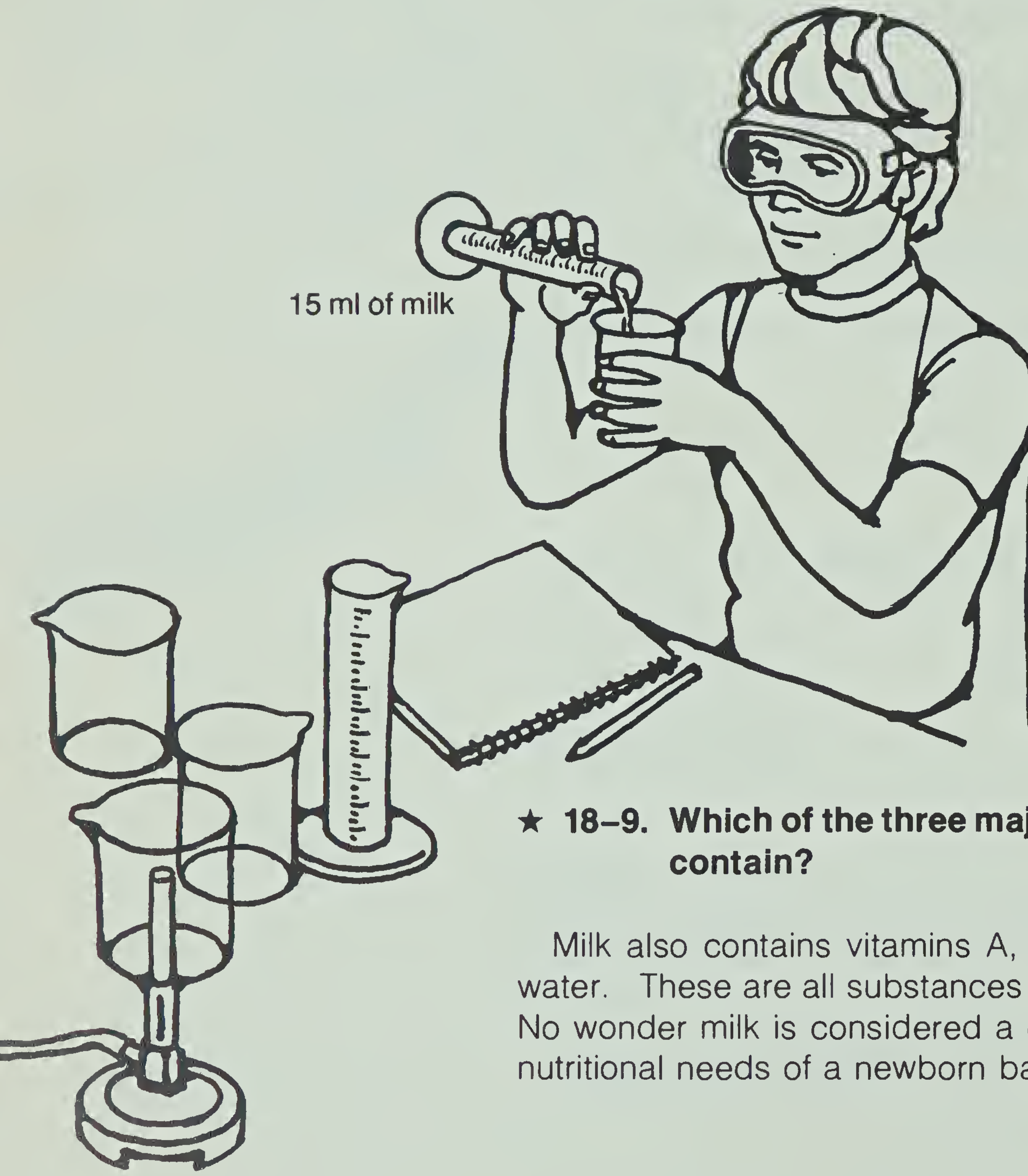
NUTRIENTS IN MILK

NUTRIENT TESTED	OBSERVATION	CONCLUSION
Fat	(?)	(?)
Protein	(?)	(?)
Starch	(?)	(?)
Sugar	(?)	(?)

Figure 18–1

A. Use a drop of cream for the fat test. Use about 15 ml of milk for each of the other tests. Clean the containers after each test and make sure you use clean containers.

B. Record your observations and conclusions in your notebook.



Clean containers after each test.

★ **18–9. Which of the three major classes of nutrients does milk contain?**

Milk also contains vitamins A, B, C, D, phosphate, calcium, and water. These are all substances that contribute to a nutritious meal. No wonder milk is considered a complete food and can supply the nutritional needs of a newborn baby.

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